S
622.33
E13c
1974

COAL DEVELOPMENT

BORROWED TIMES
Montana Reconnaissance Project
BOX 1331
MISSOULA, MONTANA 59801

STATE DOCUMENTS COLLECTION

MAR 1 1982

MONTANA STATE LIBRARY
930 E Lyndale Ave.
Helena, Montana 59601

INFORMATION PACKET

PLEASE RETURN

MONTANA
ENERGY ADVISORY COUNCIL

Lt. Governor Bill Christiansen
Chairman

December, 1974

MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

MONTANA STATE LIBRARY
S 622.33 E13c 1974 c.2
Coal development information packet /
3 0864 00019368 3

State of Montana
Office of The Lieutenant Governor
Helena 59601

BILL CHRISTIANSEN
LIEUTENANT GOVERNOR

December 23, 1974

The Honorable Thomas L. Judge
Governor of the State of Montana
State Capitol Building
Helena, Montana 59601

Dear Governor Judge:

Your Executive Order of April 23, 1973, outlined the energy development challenges Montana faces and created the Montana Energy Advisory Council to help meet those challenges. Among a number of on-going responsibilities, MEAC was directed to "assemble, analyze and interpret information and report findings to the Governor, other public and private decision-makers, and the public."

In accordance with that directive, I submit MEAC's "Coal Development Information Packet" for your use and distribution. While not all-inclusive, the packet provides broad data base useful in considering future impacts of coal and energy development in Montana.

Sincerely,

Bill Christiansen

Bill Christiansen
Lieutenant Governor

BC/sb

PRINTED ON RECYCLED PAPER

FEB 1 0 [illegible]

TABLE OF CONTENTS

Page

Table of Tables i

Table of Figures ii

Foreword iii

I. Coal Data 1

  A. Reserves 1

  B. Coal Characteristics 2

  C. Coal Ownership Patterns 8

  D. Extent of Coal Leasing 9

  E. Coal Production, Market Value, Tax and Royalty Data . 20

II. Future Coal-Based Industrial Development 30

III. Impact Data 47

  A. Electrical Generation Facilities 47

  B. Coal Gasification Facilities 49

  C. Coal Strip Mines 51

  D. Miscellaneous Employment, Groundwater and Air Quality Impact Data 54

References 66

TABLE OF TABLES

Table No.		Page
1.	Strippable Subbituminous and Lignite Coal Fields, Eastern Montana	3-4
2.	Quantitative Determinations (in ppm) for 12 Trace Elements in 67 Samples of Coal From the Powder River Basin of Northwestern Wyoming and Southeastern Montana	7
3.	Surface and Mineral Ownership of Northern Great Plains Study Area by Owner and State	9
4.	Federal, State, Private and Indian Coal Acres Under Lease in NGP States	9
5.	Coal Mineral Right Leasing	9
6.	Action for Eastern Montana Data on Coal and Surface Leases, Etc.	11-20
7.	Montana Coal Production in Tons	20
8.	Net Proceeds Tax Data	22-23
9.	Significance of Reclamation as an Allowable Deduction From Rosebud County Net Proceeds Tax	24
10.	Select Coal Taxes Paid on Calendar Year Production	25-26
11.	Strip Coal Mine License Tax Rates	27
12.	Projected Montana Coal Production From Coal Sales Contracts, By Year	28
13.	1975 and 1980 Coal Production by Coal Use (Millions of Tons)	29
14.	NGPRP Projections of Montana Coal Production by CDP	30
15.	Facilities Under Construction, Applied for or Publicly Announced	32-33
16.	Status of Prospecting Permits, Chapter 325, SLM 1973	35-42
17.	Major Water Right Applications (State)	44
18.	Filed Industrial Water Rights and Federal Options	45
19.	Generalized Specifications of Hypothetical 1000 Megawatt Power Plant in Decker-Birney Area	47
20.	Impact Data Projections for Colstrip Project (Plants I, II, III and IV)	48
21.	Generalized Specifications of Hypothetical 250 Million Cubic Feet Per Day Coal Gasification Plant in Decker-Birney Area	49
22.	Selected Impact Data for 288 Million Cubic Feet Per Day El Paso Gasification Plant, Farmington, New Mexico	50
23.	Generalized Specifications of Hypothetical 10 Million Ton Per Year Strip Mine in Decker-Birney Area	51
24.	Lands Impacted (In Acreages) Total Fort Union Portion of Northern Great Plains	52-53
25.	Calculations of Acres Required to Produce Tonnages Reported for Montana Strip Mines	53-54
26.	Total Construction Employment by Trade on the Colstrip Project	56-57
27.	Water Level Data Observation Wells Near Decker Mine	65

TABLE OF FIGURES

Figure No.		Page
1.	Map of Strippable Subbituminous Coal and Lignite Fields, Eastern Montana	5
2.	Coal Mineral Ownership, Burlington Northern, Inc. (October 1, 1955)	10
3.	Various forms of coal use for each CDP	31
4.	Coal and Uranium Prospecting Activity	43
5.	Index Map Eastern Montana Industrial Water Development	46
6.	Estimated Total Annual Average Employment on the Colstrip Construction Project, 1972-1980	55
7.	Projection of Aggregated Direct Employment, Derivative Employment and Increase Populations for the Western Energy, Peabody and Westmoreland Operations	59
8.	Estimated Total Annual Average Construction Employment During Construction of Facilities for Mining, Electrical Plants and Gasification Plants (Rosebud County, Montana 1975-2000)	60
9.	Estimated Total Annual Average Construction Employment During Construction of Facilities for Mining, Electrical Plants and Gasification Plants (Big Horn County, Montana 1975-2000)	61
10.	Sulfur Oxides -- Ambient Air Quality Data and Standards	62
11.	Maximum Ambient SO_2 Concentrations	63
12.	Index Map of Decker Monitoring Wells	64

Foreword

This information packet was prepared by the Montana Energy Advisory Council (MEAC) */ to provide summary information to all Montanans interested in or concerned about existing and potential development of the Fort Union coal deposits of Eastern Montana. Future MEAC reports will deal with reserves and development potentials of other coal deposits, noteably those in Park, Carbon, Blaine and Hill Counties.

The information packet attempts to draw few conclusions. Rather, it is intended to provide facts and projections to citizens, legislators, city and county officials, and state agency personnel who must themselves draw conclusions and make decisions regarding coal development.

This document is somewhat lengthy and not intended to be digested in one sitting. Readers are advised to use the Table of Contents and Tables of Figures and Tables as guides to subjects of concern.

The reader should recognize that adequate data are not available for some coal development considerations. MEAC has attempted to make this packet as complete and current as reasonably possible. Questions and requests for up-dated information should be directed to the referenced sources of specific data or to:

Montana Energy Advisory Council
Lieutenant Governor's Office
Capitol Building
Helena, Montana 59601
(406) 449-3773

---

*/ MEAC was created by Governor Thomas L. Judge in April 1973. It is chaired by Lt. Governor Bill Christiansen and is composed of representatives of ten member state agencies which include the Environmental Quality Council and the Departments of Agriculture, Fish and Game, Health and Environmental Sciences, Highways, Intergovernmental Relations, Labor and Industry, Natural Resources and Conservation, Social and Rehabilitation Services and State Lands. The information packet was largely compiled by John Goers, MEAC Staff Coordinator, with input or review by all MEAC agencies. Connie Cole, Dean Culwell and Sharon Solomon of the Department of State Lands; Frank Culver and Gary Fritz of the Department of Natural Resources and Conservation; Richard Draper of the Department of Intergovernmental Relations; and Vern Craig of the Department of Fish and Game made major contributions.

COAL DEVELOPMENT INFORMATION PACKET

By:

The Montana Energy Advisory Council

I. Coal.

A. Reserves.

1. Total estimated Eastern Montana reserves in beds five feet thick, or thicker, lying less than 1000 feet from the surface, by county.

Subbituminous Reserves (Millions of Tons)		Lignite Reserves (Millions of Tons)	
Big Horn	38,355	Carter	56
Garfield	137	Daniels	3,965
Musselshell	3,467	Dawson	8,332
Rosebud	26,274	Fallon	1,622
Treasure	1,304	Richland	8,068
Yellowstone	590	Roosevelt	1,632
		Valley	258
		Wibaux	1,866
Totals	70,127		25,799

Counties Containing Both Subbituminous & Lignite (Millions of Tons)	
Custer	3,463
McCone	24,501
Powder River	28,074
Prairie	1,045
Total	57,083

Grand Total: 153,009,000,000.

The Northern Great Plains Resource Program[1] figures listed above should be regarded as conservative (low) because many Montana

---

1/ The Northern Great Plains Resource Program (NGPRP) is an intergovernmental effort involving the five states of the Northern Great Plains Region (Montana, Wyoming, North Dakota, South Dakota and Nebraska) and three agencies of the U.S. Government (Environmental Protection Agency, Department of the Interior, and the Department of Agriculture) directed to projecting the impacts of coal and energy development in the region.

coal deposits have not been studied in detail. As current studies become available, total reserve and strippable reserve estimates invariably increase.

2. Mineable reserves.

NGPRP compilations (reference 1, p. 43) show about 25.5 billion tons of potentially strippable reserves and 63.1 billion tons of coal recoverable by underground mining methods. More recent work by Matson (reference 2) estimates over 42.5 billion tons of strippable coal in Eastern Montana. Matson's summary data are on a coal field basis rather than a county basis and are presented in Table 1. Figure 1 locates the referenced coal fields. Some deposits (Bull Mountains and other areas) are omitted.

3. Localized data.

Strippable coal reportedly (reference 3, p. 4) underlies over 359,000 acres of the 900,000 acre Decker-Birney study area in the Tongue River drainage of Southeastern Montana. Coal seams vary in thickness from 11 to 72 feet, with total strippable reserves of 16 billion tons.

According to Matson and Blumer (reference 4), four Southeastern Montana counties (Big Horn, Custer, Powder River, Rosebud) alone contain an estimated 32 billion tons of strippable reserves. A "strippability" limit of 100 feet was assumed for coal seams less than ten feet thick. For seams 10 to 25 feet thick, the overburden cutoff was 150 feet; for 25 to 40 foot beds, 200 feet; for deposits thicker than 40 feet, 250 feet of strippable overburden were assumed.

B. Coal Characteristics.

BTU, ash and sulfur analyses representative of 62 Montana coal fields are included in Table 1 of this summary. Heat contents vary from 5830 BTU per pound, reported for lignites in the Coal Ridge deposit, to 9652 for subbituminous coal near Decker, Montana. Most Eastern Montana coal deposits are relatively low in sulfur (less than one percent) and have moderate to low ash contents.

Sulfur emission standards, however, for power plants in urban areas are formulated on a pounds of sulfur dioxide (SO_2) per million BTU basis, rather than on the basis of the sulfur content of each ton of coal.

The average content of all coals combusted in United States power plants is 11,450 BTU per pound. Accordingly, all sulfur analyses reported in Table 1 could be put in clearer perspective by multiplying the reported sulfur content by the fraction of 11,450/x, with "x" equal to the subject coal's BTU content. A coal's suitability for the export market declines with increasing effective sulfur content. In general, those coal

Table 1:

MONTANA BUREAU OF MINES AND GEOLOGY

Strippable subbituminous and lignite coal fields, eastern Montana

No. on map	Name of field	Coal bed	Est. reserves in millions of tons	Acreage	Average tons/acre	Ash[1]	Sulfur[1]	Btu[1]
1	Decker	Anderson-Dietz 1&2	2,239.99	25,523	87,763	4.0	.40	9,652
2	Deer Creek	Anderson-Dietz 1&2	495.65	14,214	35,397	4.0	.50	9,282
3	Roland	Roland	218.04	12,076	18,055	9.2	.74	8,164
4	Squirrel	Roland	133.41	6,208	21,490	5.5	.29	7,723
5	Kirby	Anderson	216.52	5,655	38,285	4.2	.32	8,328
		Wall	473.69	5,952	79,579			
		Dietz	834.35	17,516	47,630	5.8	.59	8,509
		Canyon	158.53	4,066	38,983	5.8	.24	8,789
6	Canyon	Wall	1,884.25	23,859	78,974	4.6	.30	9,088
		Brewster-Arnold	65.86	2,067	31,859	7.5	.40	8,444
7	Birney	Brewster-Arnold	180.55	6,969	25,905	5.1	.41	9,055
8	Poker Jim Lookout	Anderson-Dietz	872.65	19,609	44,501	5.2	.37	7,925
9	Hanging Woman Cr.	Anderson	1,583.29	30,547	51,830	4.9	.29	8,496
		Dietz	1,120.96	43,654	25,678	5.5	.33	8,078
10	West Moorhead	Anderson	883.74	19,660	44,949	5.3	.36	8,296
		Dietz	397.49	20,416	19,469	4.1	.41	7,990
		Canyon	690.19	22,547	30,611	5.6	.45	8,055
11	Poker Jim O'Dell	Knobloch	373.29	7,890	47,311	5.1	.22	8,846
		Knobloch	564.78	7,187	78,581			
12	Otter Creek	Knobloch	2,075.55	25,791	80,475	4.7	.36	8,468
13	Ashland	Knobloch	2,696.20	27,200	99,125	4.8	.15	8,421
		Sawyer A & C	357.49	20,262	17,643	4.9	.49	7,883
14	Colstrip	Rosebud	1,439.26	33,379	43,118	9.5	.12	8,836
15	Pumpkin Creek	Sawyer	2,426.50	45,695	53,102	7.5	.34	7,438
16	Foster Creek	Knobloch	708.13	27,801	25,470	7.8	.76	7,573
		Terret	460.87	27,462	16,782	5.8	.21	7,770
		Flowers-Goodale	258.90	14,444	17,924	7.8	.51	7,553
17	Broadus	Broadus	739.82	18,429	40,142	7.2	.27	7,437
18	East Moorhead	T	525.21	15,559	33,756	6.2	.57	7,120
19	Diamond Butte	Canyon	418.02	21,363	19,566	4.8	.43	7,330
20	Goodspeed Butte	Cook	628.95	13,446	46,775	10.6	1.63	6,771
21	Fire Gulch	Pawnee & Cook	336.69	8,486	39,674	3.8	.33	7,739
22	Sweeney-Snyder	Terret	326.33	10,921	29,880	9.1	.11	8,175
23	Yager Butte	Elk & Dunning	1,175.86	26,924	43,673	4.8	.33	7,646
		Cook	312.02	14,507	21,507	6.7	.63	7,254
24	Threemile Buttes	Canyon & Ferry	225.40	13,836	16,289	5.5	.94	6,867
25	Sonnette	Pawnee	320.25	8,224	38,940	9.8	.88	6,964
		Cook	362.98	10,470	34,668	8.1	1.23	6,891
26	Home Creek Butte	Canyon & Ferry	217.21	4,851	44,774			
27	Little Pumpkin Creek	Sawyer A&C, D, X, & E	215.83	8,534	25,290			
28	Sand Creek	Knobloch	267.34	5,952	44,915	6.6	.30	7,340
29	Beaver-Liscom	Flowers-Goodale & Terret	135.87	8,851	15,350	8.1	.96	8,102
		Knobloch	491.62	17,075	28,791	7.7	.50	8,027
30	Greenleaf-Miller Creek	Rosebud, Knobloch, and Sawyer	453.71	14,918	30,413	7.5	.71	8,422
31	Pine Hills	Dominy	193.87	6,022	32,191	7.2	.53	7,293
32	Knowlton	Dominy (M & L)	747.51	19,613	38,112	7.1	.41	6,710
		Dominy (U)	120.31	4,448	27,048	5.6	.38	6,645
33	Sarpy Creek	Rosebud-McKay	1,500.00	42,373	35,400	6.5	.50	8,600
34	Cheyenne Meadows	Knobloch	1,200.00	13,560	88,500	4.1	.40	8,400
35	Little Wolf	Rosebud-McKay	314.00	7,411	42,370			
36	Jeans Fork		90.00	3,800	23,685			
37	Wolf Mountains		1,922.00	31,000	62,000			
38	Lame Jones	Dominy	150.00	10,593	14,160			6,020
39	Lamesteer	Harmon(?)	35.00	1,978	17,700			6,332
40	Wibaux	C	643.00	18,518	34,720	7.9	.90	6,050
41	Little Beaver	C	134.00	8,445	15,865			
42	Four Buttes	C	91.00	5,180	17,570			6,140
43	Hodges		10.00	807	12,390			
44	Griffith Creek		10.00	568	17,700			

Table 1 Cont'd.

MONTANA BUREAU OF MINES AND GEOLOGY

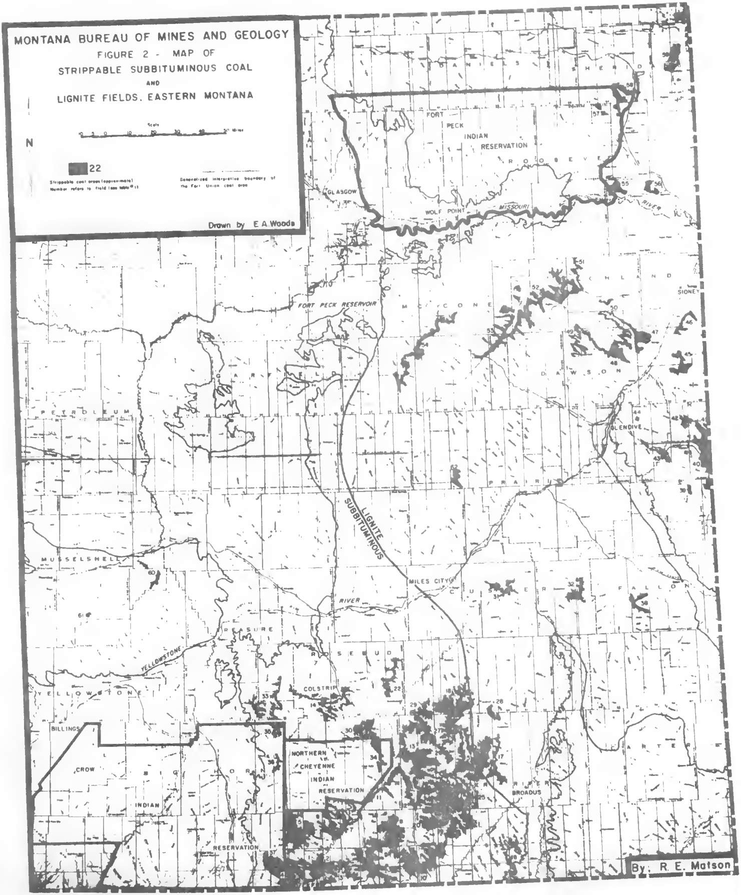
Strippable subbituminous and lignite coal fields, eastern Montana

No. on map	Name of field	Coal bed	Est. reserves in millions of tons	Acreage	Average tons/acre	Ash[1]	Sulfur[1]	Btu[1]
45	Smith-Dry Creek	G	150.00	8,475	17,700			
46	O'Brian-Alkalie Creek		150.00	8,475	17,700			
47	Breezy Flat	Pust	200.00	7,062	30,090	6.7	.50	6,660
48	Burns Creek	Pust	200.00	7,062	30,090			
49	N.F.Thirteen Mile Creek	Pust	225.00	5,085	44,250			6,880
50	Fox Lake	Pust	46.00	2,166	21,240			6,880
51	Lane	Lane	561.00	44,582	12,390			7,150
52	Carroll	Carroll	345.00	29,780	11,584	5.5	.30	7,400
53	Redwater River	S	642.00	24,181	26,550	6.1	.40	7,400
54	Weldon-Timber Creek	S	724.00	25,565	28,320			7,660
55	Fort Kipp	Ft. Kipp-Ft. Peck	331.00	14,500	22,830	4.6	.20	6,110
56	Lanark	Lanark	100.00	3,531	12,390	6.3	.40	6,853
57	Medicine Lake		58.00	3,740	15,510	7.2	1.00	6,870
58	Reserve		246.00	18,231	13,495	7.6	.40	6,599
59	Coal Ridge	Coal Ridge	150.00	19,200	17,700	7.5	.40	5,830
60	Carpenter Creek	Carpenter	50.00	3,211	14,015	6.5	.40	9,270
61	Charter	Mammoth	60.00	3,210	17,700	6.0	.90	10,190
62	Little Sheep Mtn.	A&C	200.09	10,272	19,470			
		TOTAL	42,561.93	1,152,640				

[1] "As received" basis (where more than one sample available, figures given are average figures).

By Robert F. Matson

Figure 1


MONTANA BUREAU OF MINES AND GEOLOGY
FIGURE 2 - MAP OF
STRIPPABLE SUBBITUMINOUS COAL
AND
LIGNITE FIELDS, EASTERN MONTANA
Scale
10 5 0 10 20 30 40 50 Miles
N
22
Strippable coal areas (approximate)
Number refers to field (see table #1)
Generalized interpretive boundary of the Fort Union coal area
Drawn by E A Woods
DANIELS
SHERIDAN
FORT PECK INDIAN RESERVATION
VALLEY
ROOSEVELT
GLASGOW
WOLF POINT
MISSOURI RIVER
FORT PECK RESERVOIR
McCONE
RICHLAND
SIDNEY
DAWSON
GARFIELD
PETROLEUM
GLENDIVE
WIBAUX
PRAIRIE
LIGNITE
SUBBITUMINOUS
MUSSELSHELL
MILES CITY
CUSTER
FALLON
RIVER
TREASURE
YELLOWSTONE
ROSEBUD
COLSTRIP
YELLOWSTONE
BILLINGS
CROW
INDIAN
RESERVATION
BIG HORN
NORTHERN CHEYENNE INDIAN RESERVATION
POWDER RIVER
BROADUS
CARTER
58
57
55
56
51
52
50
53
54
49
46
47
45
48
44
42
43
40
39
60
61
32
31
36
7
22
18
28
29
33
14
30
27
13
34
17
11
25
5
20
37
12
10
By: R. E. Matson

characteristics (BTU, sulfur, ash contents and ash fusion temperatures) that influence coal marketability are much better known than coal properties that bear on the impacts of coal conversion. For example, much less data exists regarding trace metal contents of coal and coal ash. Little is known about the ultimate fate of trace metals borne in stack emissions and their long-term effects on human health, soils, vegetation and animal life downwind from Northern Great Plains power plants. Eastern power plants are known to affect vegetation and rain water composition.

Subbituminous coal trace element analyses recently released by the Northern Great Plains Resource Program (reference 1, p. 70-70A) are presented in Table 2 on the following page.

Trace metal contents of any given coal seam can and do show great variation over short distances, both lateral and vertical. Accordingly, detailed mine-site-specific trace element analyses, such as those presented in Section 8.3.1 of the Montana Energy Planning Division's Draft Environmental Impact Statement on Colstrip Units 3 and 4 are widely needed.

The NGPRP (reference 1, p. 61) reports that "the amount of data on trace elements in lignite is limited . . . ", and gives only approximated average trace metal contents for Montana and North Dakota lignites. The NGPRP averages in parts per million are as follows:

Elemental Analyses in Parts Per Million

Boron (B)	150.0	Nickel (Ni)	7.0
Barium (Ba)	500.0	Lead (Pb)	5.0
Beryllium (Be)	0.5	Scandium (Sc)	1.0
Cobalt (Co)	2.0	Tin (Sn)	1.0
Chromium (Cr)	5.0	Strontium (Sr)	200.0
Copper (Cu)	20.0	Titanium (Ti)	250.0
Gallium (Ga)	2.0	Vanadium (V)	10.0
Germanium (Ge)	1.0	Yttrium (Y)	7.0
Lanthanum (La)	6.0	Ytterbium (Yb)	0.5
Manganese (Mn)	100.0	Zinc (Zn)	10.0
Molybdenum (Mo)	1.5	Zirconium (Zr)	15.0

According to the NGPRP, the total sulfur content of lignite in the Dakotas and Montana is low, averaging 0.6 percent. The sulfur in lignite (and other ranks of coal) occurs primarily in organic compounds and in pyrite or marcasite (both FeS_2). The proportional amount of pyrite sulfur varies greatly, but generally ranges from one-third to two-thirds of the total sulfur content. Eight important trace elements (copper, lead, zinc, arsenic, cadmium, mercury, antimony and selenium) are generally associated with pyrite in coal and their concentrations are thus likely to vary with the content of pyritic sulfur.

The NGPRP (reference 1, p. 62) reports 0.02 ppm. mercury in lignite from Knife River's mine near Savage, Montana. Localized Southwest North Dakota uranium concentrations of 1000 ppm. or higher, and common concentrations of 30 ppm. uranium in unmineralized lignite were also noted.

Table 2: Quantitative Determinations (in ppm) for 12 Trace Elements in 67 Samples of Coal From the Powder River Basin of Northwestern Wyoming and Southeastern Montana. (In Thickness Column, (T) and (B) Indicate Top and Bottom of Bed, Respectively. Values for Cd, Cu, Li, Pb and Zn Are Calculated From Analyses on Ash of Coal.)

Thickness of Sample Interval (feet)	As	Cd	Cu	F	Hg	Li	Pb	Sb	Se	Th	U	Zn	Ash (percent)
DIETZ COAL BED, DECKER MINE, DECKER, MONTANA													
(Tipple)	3	<0.05	8.6	---	0.103	4.4	2.3	---	0.4	<1.5	0.6	3.8	4.76
do.	4	< .05	8.2	50	.108	4.4	2.4	0.3	.6	<1.5	.6	4.5	4.89
do.	5	< .05	9.2	---	.110	5.3	2.6	---	.9	<1.5	.8	5.8	5.36
ROSEBUD COAL BED, BIG SKY MINE, COLSTRIP, MONTANA													
6.8(T)	1	<0.1	7.6	105	0.04	12.	6.0	0.3	0.7	<1.5	0.4	1.9	9.17
5.7	1	<.1	6.2	<20	.03	18.	5.9	.3	.2	<1.5	.6	2.4	9.84
5.0	1	<.1	6.5	<20	.06	13.	5.0	.2	.2	<1.5	.4	2.6	8.28
5.0	1	<.1	8.7	40	.08	10.	5.6	.3	.8	<1.5	.5	3.0	10.2
2.1	1	<.1	3.6	<20	.06	3.7	3.0	.4	.8	<1.5	.5	2.0	5.01
.5	2	<.1	43.0	100	.05	122	36.0	.5	2.4	<1.5	1.5	23.0	51.7
2.5(B)	2	<.1	7.0	20	.14	8.9	6.4	.5	.8	<1.5	.8	3.1	9.11
(Tipple)	2	.1	7.7	60	.07	14.	7.5	.5	.5	<1.5	.7	5.4	11.5
McKAY COAL BED, BIG SKY MINE, COLSTRIP, MONTANA													
5.4(T)	1	<0.1	4.6	70	0.05	6.6	5.4	2.7	0.4	<1.5	0.8	2.5	7.18
ROSEBUD COAL BED, ROSEBUD MINE, COLSTRIP, MONTANA													
(Shot-pile)	2	<0.1	10.1	60	0.075	14.	7.9	0.7	0.9	5.1	1.2	2.1	13.0
do.	2	< .1	10.7	---	.053	24.	8.6	---	1.0	4.0	1.3	2.5	13.7
McKAY COAL BED (CORES), ROSEBUD MINE, COLSTRIP, MONTANA													
?	---	---	---	---	0.144		---	---	---	---	---	---	9.73
?	---	---	---	---	.160		---	---	---	---	---	---	9.40
?	---	---	---	---	.143		---	---	---	---	---	---	10.0
?	---	---	---	---	.148		---	---	---	---	---	---	13.1

C. Coal Ownership Patterns.

Only in the earliest days of homesteading did the federal government convey mineral and coal rights with surface homesteads. Most Montana homestead land sits over federally-owned coal and minerals. Similarly, much of the railroad lands sold by the Northern Pacific and Great Northern Railroads was conveyed without coal and mineral rights (Fig. 2). Accordingly, split ownership of the surface and coal estates is more the rule than the exception in Eastern Montana.

For example, in the Decker-Birney area (reference 3, p. 1) the following ownership patterns prevail:

Ownership	Surface Estate Acres	Percentage of Total	Mineral Estate Acres	Percentage of Total
BLM	78,673	9	626,480	70
Forest Service	153,496	17	162,477	18
State	48,000	5	48,000	5
Private	618,540	69	61,752	7

Federal agencies control 88 percent of the area's mineral estate and 26 percent of the surface. Private interest controls only 7 percent of the mineral and 69 percent of the surface.

The Crow Tribe of Indians maintains coal and mineral ownership in the vast Crow ceded strip, an area lying north of the Crow Reservation and south of the Yellowstone River. Surface ownership is predominantly by non-Indian ranching interests. As evidenced by current Westmoreland Resources Sarpy Basin stripping operations, mining activity in this area involves removing Indian coal from beneath non-Indian ranch land. A Westmoreland official reports that the company has purchased about 10,000 acres in the Sarpy Basin and has options to purchase an additional 5,000 acres.

In McCone County coal areas, the great majority of the surface estate is in private non-corporate ownership. About six percent of the total is state school trust land with lesser amounts of surface administered by the BLM. Excluding a six percent state mineral ownership (Sections 16 and 36 generally) the mineral estate ownership pattern is a checkerboard alternation of Burlington Northern and federal coal (Figure 2).

In Table 3 on the following page, railroad mineral and surface ownership is lumped in the broad county-municipal-private category. Accordingly, split ownership situations involving railroad coal and noncorporate private surface are not reflected.

Table 3 (Reference 5, p. II-6): Surface and Mineral Ownership of Northern Great Plains Study Area By Owner and State (In Percentage of Total)

State (Fort Union Coal Portion)		Federal	Indian	County Municipal Private	State
Montana	surface	17.0	8.2	69.0	5.8
	mineral	33.0	7.9	53.3	5.8
North Dakota	surface	7.3	2.7	87.5	2.5
	mineral	20.3	3.8	73.4	2.5
Wyoming	surface	22.9	---	68.5	8.6
	mineral	42.6	---	48.7	8.7

Figure 2 on the following page shows most of the railroad coal ownership in Eastern Montana.

D. Extent of Coal Leasing.

The NGPRP (reference 5, p. 5) documents three state coal leasing patterns as follows:

Table 4: Federal, State, Private and Indian Coal Acres Under Lease in NGP States (In Thousand Acres)

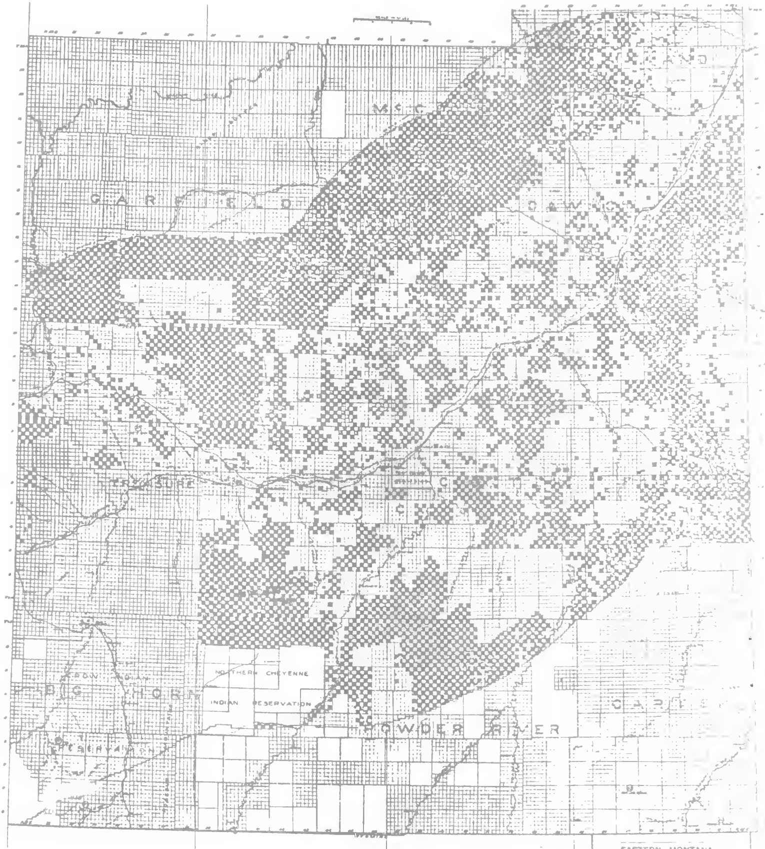
State	Federal Coal	State Coal	Private Coal	Indian Coal	Total for State
Montana	36	58	334 (est.)	77	505
North Dakota	16	--	1,000 (est.)	--	1,016
Wyoming	200	400	200 (est.)	--	800
Totals	252	458	1,534 (est.)	77	2,321

State, federal and Indian coal leasing activity (1973 levels) in five Southeastern Montana counties is documented below. (Reference 6, p. 1)

Table 5: Coal Mineral Right Leasing (Acres)

	Rosebud	Treasure	Big Horn	Custer	Powder River	Total
State	13,217	957	18,968	1,920	8,464	43,526
Federal	10,560	920	18,456	---	---	29,936
Indian	16,035	---	61,124	---	---	77,159
Totals	39,812	1,877	98,548	1,920	8,464	150,621

Source: Northern Plains Resource Council



Note: Railroad coal ownership in Musselshell County and points west not shown.

The Northern Cheyenne Tribe of Indians has gained partial success in petitioning the Department of the Interior to cancel all existing leases and prospecting permits on the Northern Cheyenne Reservation. The Crow Tribe of Indians have initiated similar actions regarding leases on the Crow Reservation. Accordingly, the status of the 77,159 acres of Indian coal leases is uncertain.

Most significant are the private lease and lease option data recently compiled for 12 Eastern Montana counties by Action for Eastern Montana. 2/ The county-by-county summaries presented in Table 6 indicate that energy corporations and lease brokers have obtained interests in over 1,300,000 acres. The interests are primarily in the form of leases of surface and/or coal holdings, options to lease and mining leases which essentially convey the rights to strip mine. Similar data are being prepared for other counties by the Billings-based Northern Plains Resource Council.

The first date appearing beneath each county name marks the date of the first recorded lease or option. The second date records last filing noted by the survey.

Table 6: Action for Eastern Montana
Data on Private Coal and Surface Leases, Etc.

Carter County (Jan. '66 - May '74)
Coal, Uranium and Bentonite Activity

	Acres
Mining Leases (predominantly uranium)	92,464
Mining Claims (uranium and bentonite)	146,495
Surface Agreements (coal)	6,729
Exploration With Option To Lease (coal)	9,160
Grand Total	251,848

Mining Leases:

Felmont Oil Company	35,384
Kerr-McGee	24,180
Mobile Oil Company	8,460
Frontier Resources	7,680
Invicta Corporation	11,240
Montana Nuclear Corporation	5,520
Total Mining Leases	92,464

2/ Action for Eastern Montana is a non-profit, Glendive-based corporation primarily funded by the federal government. Its major function is to analyze the needs of 17 Eastern Montana counties in terms of education, transportation, housing, aging, health and medical services. The corporation undertook the coal and surface lease inventory because coal development may greatly influence future levels of services neede For certain counties, coal, bentonite and uranium lease data were not separated.

Table 6 Cont'd.

	Acres
Mining Claims	
Kerr-McGee	64,290
Montana Nuclear Corporation	17,965
Felmont Oil Company	10,780
Mobil Oil	24,800
Other (Finger Butte Claims, Burley Claims, Foster, Central Resources, John McQuire, Bug Tussle, Pilster, South Side, Bell and Walker	25,660
Total Mining Claims	143,495
Surface Agreements	
Consolidation Coal Company	6,729
Exploration with Option to Lease	
Western Energy	9,160

All listed mining claims are not coal related, but are for bentonite or uranium. The mining leases can be for coal, uranium or bentonite. (The contracts did not specify.)

Custer County (May '70 - July '74)

Coal Leases	27,544
Surface Agreements	3,468
Exploration and Option for Coal Lease	115,080
Grand Total	146,092
Coal Leases	
Consolidation Coal Company	15,018
Phillips Petroleum Company	12,526
Total Coal Leases	27,544
Surface Agreements	
Consolidation Coal Company	3,468
Exploration and Option for Coal Lease	
Consolidation Coal Company	63,900
Western Energy	51,180
Total	115,080

Table 6 Cont'd.

Dawson County (July '70 - June '74)

	Acres
Coal Leases	102,645
Surface Agreements	42,412
Mining Leases	7,204
Oil, Gas and Mineral Leases	2,080
Grand Total	154,341
Coal Leases	
HFC	59,400
Charles Hauptman	19,374
Tenneco	16,488
Thomas Keating	3,200
Joe Halverson	1,360
Consolidation Coal	953
John Howell	640
Sun Oil	640
Fred Tiddens	590
Total Coal Leases	102,645
Surface Agreements	
Consolidation Coal	30,198
Tenneco	12,214
Total Surface Agreements	42,412
Mining Leases	
Kerr-McGee Corporation	3,204
John Wold	3,200
Getty Oil	800
Total Mining Leases	7,204
Oil, Gas and Mineral Leases	
Gulf Oil	2,080

Table 6 Cont'd.

Garfield County (Dec. '68 - May '74)

	Acres
Coal, Uranium and Mineral Lease	20,131
Mining Claims	1,040
Royalty Conveyance	580
Mineral Deeds	8,960
Grand Total	30,711

Coal, Uranium and Mineral Lease	
Chevron Oil Company	20,131
Mining Claims	
Kaoben, Inc.	1,040
Royalty Conveyance	
Kern County Land Company	580
Mineral Deeds	
Kern County Land Company	8,960

Kern County Land Company, a subsidiary of Tenneco, has the rights, as stated in the mineral deeds, of ingress and egress at all times for the purpose of operating and developing lands for oil, gas and other minerals.

Fallon County (Sept. '72 - July '74)

Abstract of Option for Coal Lease	135,758
Coal Leases	15,877
Surface Agreements	7,525
Abstract of Instrument Coal Lease - Surface Agreement	20,850
Grand Total	180,010

Table 6 Cont'd.

	Acres
Western Energy	
Abstract of Option for Coal Lease	135,758
Tenneco	
Abstract of Instrument for Coal Lease	15,237
Abstract of Instrument for Surface Agreement	7,205
Abstract of Instrument for Coal Lease - Surface Agreement	20,850
Consolidation Coal Company	
Coal Leases	640
Surface Agreements	320
McCone County (May '72 - May '74)	
Coal Leases	60,482
Surface Agreements	38,950
Mining Leases	8,153
Grand Total	107,585
Wesco Resources	
Abstract of Agreement for Coal Lease	40,696
Abstract of Agreement for Surface Agreement	38,950
Abstract of Agreement for Mining Leases	8,153
Northsworthy and Reger	
Coal Lease	19,786
Powder River (Oct. '66 - May '74)	
Coal Leases	87,168
Surface Agreements	24,720
Exploration with Option to Coal Lease	35,580
Oil, Gas and Mineral Lease	880
Grand Total	148,348

Table 6 Cont'd.

	Acres
Norsworthy and Reger	
Coal Leases	5,840
Surface Agreements	24,720
Exploration with Option to Coal Lease	4,000
Sentry Royalty	
Coal Leases	57,320
Wesco Resources	
Exploration with Option to Coal Lease	5,120
Valley Camp Coal Company	
Exploration with Option to Coal Lease	5,060
Sun Oil	
Coal Leases	24,008
Oil, Gas and Mineral Lease	880
Patrick McDonough	
Exploration with Option to Coal Lease	21,400

Prairie County (Dec. '72 - Feb. '73)

Consolidation Coal Company	
Exploration with Option to Acquire Coal Lease (Must be exercised by Dec. 2, 1974)	7,380
Coal Lease	640
Grand Total	8,020

Richland County (May '72 - April '74)

Coal Leases	21,492
Surface Agreements	12,980
Options for Coal Lease	2,560
Grand Total	37,032

Table 6 Cont'd.

	Acres
Consolidation Coal Company	
Coal Leases	13,307
Surface Agreements	12,980
Sun Oil	
Coal Leases	4,768
Joseph Hankins	
Exploration and Option for Coal Lease	2,560
Norman Jessons	
Coal Lease	1,920
John Howell	
Coal Lease	857
Fred Tiddens	
Coal Lease	640

Rosebud County (June '59 - July '74)

Coal Leases	43,654
Surface Agreements	12,887
Mining Leases	28,760
Options for Coal Lease	15,515
Options for Surface Lease	6,785
Deeds, Indentures, Contracts (coal-related)	16,720
Grand Total	124,321
Sentry Royalty	
Coal Leases	30,160
Norsworthy and Reger	
Coal Leases	9,774
Double Eagle Pet and Mining Co.	
Coal Leases	1,000

Table 6 Cont'd.

	Acres
Arvid Ideen	
Mining Leases	27,160
Bell Western	
Mining Leases	1,600
Montana Power Company	
Deed, Indentures (coal related)	2,080
Western Energy	
Option for Coal Lease	9,080
Deed, Contracts, Indentures (coal related)	4,400
Peabody Coal Company	
Coal Leases	2,080
Deeds, Indentures (coal related)	5,280
Consolidation Coal Company	
Surface Leases	6,080
Coal Leases	640
Warranty Deeds (coal related)	4,960
Wesco Resources	
Option for Coal Lease	6,435
Option for Surface Lease	6,785
Surface Lease	6,807

Treasure County (Oct. '67 - June '73)

Exploration and Option for Coal Lease	9,680
Coal Leases	4,480
Surface Agreements	7,420
Combination Leases	6,100
Bentonite Leases	3,840
Grand Total	31,520

Table 6 Cont'd.

	Acres
Westmoreland	
Coal Leases	640
Exploration with Option for Coal Lease	9,680
Consolidated Coal Company	
Surface Agreements	7,420
Amax Coal Company	
Coal Leases	3,840
Hallet Minerals	
Bentonite Leases	3,840
Combination Leases	
Amax-Coal Leases Consolidation-Surface Agreements Westmoreland-Exploration	2,140
Amax-Coal Leases Westmoreland-Exploration	3,120
Consolidation-Surface Agreements Westmoreland-Exploration	840

"Combination leases" is simply our term used to describe the same tract of land on which two or more companies have made different types of agreements. (The acreage is unduplicated.)

Bentonite leases are not coal related.

Wibaux County (Mar. '72 - Mar. '74)

Coal Leases	16,391
Surface Agreements	37,169
Mining Leases	32,257
Grand Total	85,817

Table 6 Cont'd.

	Acres
Tenneco	
Coal Leases	16,391
Mining Leases	23,970
Surface Agreements	37,169
Consolidation Coal Company	
Mining Leases	4,492
L. V. O. Corporation	
Mining Lease	643
Farmers Union Central Exchange	
Mining Lease	429
Joe Halvorson	
Mining Lease	2,083
John Howell	
Mining Lease	640

No information about the disposition of Burlington Northern's vast coal holdings (Figure 2) is included in Table 6. According to Action for Eastern Montana, no Burlington Northern coal leases, lease options, etc., are on public record in eleven of the twelve counties surveyed. Some Burlington Northern coal lease data are reportedly on record in McCone County, but were not included in the Action for Eastern Montana compilations.

E. Coal Production, Market Value, Tax and Royalty Data.

Table 7: Montana Coal Production
in Tons 1967-1973

1967	355,961	1971	7,071,526
1968	507,125	1972	8,243,647
1969	1,018,270	1973	10,721,413
1970	3,511,778		

As evidenced by the company-by-company production, price, royalty and tax data presented in Table 8, less than 51,000 tons of the total for any given year was produced by underground mining methods ("others" category). The Western Energy and Peabody Coal Companies operate strip mines in Rosebud County. Westmoreland Resources and the Decker Coal Company strip mine in Big Horn County. Knife River Coal's production is from Richland County. Consolidation Coal's 1971 production was from a strip mine test pit in the Bull Mountains of Musselshell County. Two small "family" strip mines operate near Roundup.

Table 9 (reference 8, exhibit A-4) illustrates the extent to which income to counties can be reduced by the present practice of allowing reclamation costs as a deduction from net proceeds tax collections.

Table 10 summarizes most Montana taxes directly paid by coal mining companies. For comparative purposes, total annual production by company is in Table 8. The following paragraphs define the nature of each tax.

The coal mining industry is affected by the following four major taxes: Net Proceeds Tax, Resource Indemnity Trust Tax, Strip Coal mines License Tax and a Corporate License Tax. All mineral production, including oil and gas is subject to the Net Proceeds Tax, while the Strip Coal Mine License Tax pertains exclusively to coal. All corporations are subject to corporate license taxes, and the Resource Indemnity Trust Act includes all "nonrenewable resource" extracting firms. All of these taxes are imposed and collected by the state except the net proceeds tax, which is collected at the county level, but imposed by authority granted by state statute. These taxes represent the bulk of taxes paid by strip coal mine operators to the state; however, other property taxes paid by the coal industry, related business license taxes, and gross vehicle weight taxes yield added revenue.

Net Proceeds Tax -- tax on net proceeds of mines. This tax is imposed on the valuation placed on the net proceeds of the mining firm. The law provides that the net proceeds valuation shall be taxed as Class 1 property. This property is taxed on a basis of 100 percent "true and full value". It then becomes subject to state and county millage levied against property at exactly its assessed value.

Royalties paid may be deducted as a cost of extracting by the producer, but he must then submit a list of those to whom such royalties were paid to the Department of Revenue. The Department of Revenue then sends an assessment list to the county assessor of the county in which the mines are located, and such royalties become taxable as Class 1 property of the payees on the tax rolls at full cash value. In this process, royalties become an expense of the coal producer and taxable property of the payee.

Table 8: Net Proceeds Tax Data

Cal. Year	Production (Tons)	Gross Price Per Ton	Gross Value	Gross Price Per Mil. BTU's	Production Costs (Less Royalties)	Production Costs Per Ton	Royalties	Royalties Per Ton	Net Proceeds Exclud. Royalty	Net Proceeds Per Ton	Net Proceeds Per Mil. BTU's
WESTERN ENERGY COMPANY											
1973	4,253,781	$2.011	$8,553,345	$.116	6,351,279	$1.493	$580,023	$.136	$1,622,043	$.381	$.0220
1972	5,500,775	1.792	9,856,205	.103	5,863,478	1.066	738,854	.134	3,253,873	.592	.0341
1971	5,161,390	1.743	8,996,564	.100	4,633,336	.898	696,788	.135	3,666,440	.710	.0409
1970	1,657,737	1.694	2,808,079	.098	1,399,586	.844	223,794	.135	1,184,699	.715	.0412
1969	521,449	1.811	944,470	.104	449,230	.862	67,828	.130	427,411	.820	.0473
1968	150,416	1.800	270,748	.104	283,686	1.886	18,050	.120			
PEABODY COAL COMPANY											
1973	1,971,643	2.1525	4,244,484	.125	3,449,633	1.750	603,663	.306	191,188	.097	.0056
1972	1,601,179	1.9703	3,154,795	.115	2,360,650	1.474	639,465	.399	154,680	.097	.0056
1971	1,495,222	1.8857	2,819,557	.110	1,767,256	1.182	585,610	.392	466,691	.312	.0182
1970	1,431,956	1.843	2,639,232	.107	1,914,411	1.337	496,940	.347	227,881	.159	.0093
1969	163,691	1.817	297,574	.106	248,237	1.516	28,660	.175	20,677	.126	.0073
DECKER COAL COMPANY											
1973	4,159,287	3.931	16,350,157	.203	7,789,805	1.873	1,723,639	.414	6,836,713	1.644	.0848
1972	792,949	3.470	2,752,674	.179	2,669,696	3.367	168,332	.212			
1971							2,679				
1970	74,856	4.6224	346,015	.239	705,439	9.424	70,963	.948			
KNIFE RIVER COAL COMPANY											
1973	312,785	2.578	806,359	.198	615,393	1.967	25,697	.082	165,268	.528	.0405
1972	320,975	2.434	781,233	.187	567,550	1.768	27,128	.085	186,566	.581	.0446
1971	325,475	2.254	733,549	.173	456,802	1.403	26,085	.080	250,662	.770	.0591
1970	321,908	2.116	681,108	.162	402,455	1.250	26,896	.084	251,758	.782	.0600
1969	306,928	2.016	618,637	.155	349,845	1.140	26,124	.085	242,668	.791	.0607
1968	329,022	1.947	640,625	.149	313,710	.953	26,504	.081	300,411	.913	.0701

Table 8 Cont'd.

Cal. Year	Production (Tons)	Gross Price Per Ton	Gross Value	Gross Price Per Mil. BTU's	Production Costs (Less Royalties)	Production Costs Per Ton	Royalties	Royalties Per Ton	Net Proceeds Exclud. Royalty	Net Proceeds Per Ton	Net Proceeds Per Mil. BTU's
KNIFE RIVER COAL COMPANY Cont'd.											
1967	326,757	$1.948	$636,563	$.149	391,756	$1.199	$27,646	$.085	$217,162	$.665	$.0510
1966	325,348	1.940	631,265	.149	372,139	1.144	24,521	.075	234,605	.721	.0553
CONSOLIDATION COAL COMPANY											
1971	38,679	3,975	153,737		214,199	5.538	3,377	.087			
OTHERS (Square Deal, Westmoreland - no production in subject tax years, William Nies, Victor and Jack Carlson, Brenteson, Stephenson, Schoonover, Rosebud Coal Sales)											
	Total	**Avg.**	Total		Total	Avg.	Total		Total		
1973	23,917	11.04	264,117		303,712	12.70	6,055	.253	3,750		
1972	27,769	10.12	281,011		281,077	10.12	8,566	.308	5,412		
1971	50,760	5.83	295,682		324,368	6.39	6,843	.135	14,193		
1970	25,321	10.17	257,411		253,281	10.00	6,796	.268	1,212		
1969	26,202	9.61	251,823		251,844	9.61	6,662	.254			
1968	27,687	8.88	245,793		246,178	8.89	6,021	.217	312		
1967	29,204	8.33	243,170		249,322	8.54	4,683	.160	165		

Table 9: Significance of Reclamation as an Allowable Deduction From Rosebud County Net Proceeds Tax

Peabody Production for 1973 = 1,971,643 tons.

Request for reclamation allowance	$449,467.00
Taxable net proceeds, with reclamation deductible	191,188.00
Taxable net proceeds, without reclamation deductible	640,655.00
1973 taxes paid, with reclamation deductible	25,741.74
1973 taxes due, without reclamation deduction	86,258.43
Rosebud County tax subsidization of reclamation	60,516.69
Tax paid per ton, with reclamation deductible	0.013
Tax due per ton, without reclamation deduction	0.044

If one were to make an arbitrary assumption and compare the 1973 disturbed acres along with the request for a deduction of $449,467, you would arrive at reclamation costs per acre disturbed of $12,500. Both the Burlington Northern Railroad, reclaiming old spoils, and Western Energy, doing concurrent reclamation, indicate reclamation costs of slightly more than $700 per acre.

Peabody Production for 1969 - 1973 = 6,663,691 tons.

Assuming 51,381 tons per acre, at 1730 tons per acre foot, total seam thickness of 33 feet and 90 percent recovery, 6,663,691 divided by 51,381 equals 129.7 acres disturbed by mining operations.

If claimed reclamation costs for 1969 through 1973 total $575,257, then $575,257 divided by 129.7 equals $4,435.29 per acre claimed reclamation costs.

These reclamation costs are actually understated because Peabody had not reclaimed all 129.7 acres.

Table 10: Select Coal Taxes Paid on Calendar Year Production

Calendar Year	Real & Pers. Property Tax	Net Proceeds	Strip Coal Mines License Tax	Taxes on Royalties
WESTERN ENERGY COMPANY				
1973	73,285.60	211,449.53 */	837,469.99	58,295.13
1972	52,180.00	438,101.46	419,154.48	93,166.20
1971	51,191.74	418,780.78	327,476.77	79,587.08
1970	32,090.58	147,471.33	76,214.10	27,857.93
1969	12,224.47	58,854.49	21,639.89	9,339.95
PEABODY COAL COMPANY				
1973	41,294.95	24,923.27 */	397,103.60	78,693.51
1972	21,590.16	20,826.12	106,691.34	86,097.57
1971	23,427.22	53,305.45	92,238.42	66,888.37
1970	22,329.67	28,366.63	69,097.80	61,859.09
1969	11,716.16	2,847.22	5,684.25	3,938.22
DECKER COAL COMPANY				
1973	52,039.64	674,510.10 */	1,181,354.04	101,646.04
1972	51,306.79		78,794.90	7,975.02
1971				
1970			1,242.79	
KNIFE RIVER COAL COMPANY				
1973	12,120.18	23,425.09 */	25,309.14	2,683.04
1972	11,703.19	29,768.47	14,352.61	1,877.65

---

*/ Estimated on an eight-year average mill levy.

Table 10 Cont'd.

Calendar Year	Real & Pers. Property Tax	Net Proceeds	Strip Coal Mines License Tax	Taxes on Royalties
KNIFE RIVER COAL COMPANY CONT'D.				
1971	10,848.32	39,013.03	12,516.97	3,507.03
1970	11,882.23	35,419.83	11,466.70	1,999.54
1969	10,754.98	36,300.71	10,284.93	2,366.10
CONSOLIDATION COAL COMPANY				
1971			2,981.00	451.89
OTHERS				
1973	478.00	491.93 */	843.82	598.61
1972	555.00	716.12	324.10	675.10
1971	1,015.00	1,906.83	2.67	857.56
1970	506.00	172.75		436.57
1969	524.00			210.17

---

*/ Estimated on an eight-year average mill levy.

Resource Indemnity Trust Account Tax -- tax on value of product extracted. The act creating the Resource Indemnity Trust Account was passed by the 1973 legislature and first affected taxes in the calendar year 1973. The tax is imposed at the ratio of one-half percent of the gross mine-mouth or wellhead value of all nonrenewable mineral resources, including coal, oil and gas. The monies are deposited in a special earmarked account in the Trust and Legacy Fund. The revenues and interests earned will remain untouched until $10 million are accumulated. At that time, the legislature may appropriate the annual interest to areas subject to social, economic or environmental impacts of mineral development. After the fund reaches $100 million, both the interest and each year's revenues may be appropriated. Because of certain confidentiality provisions, MEAC is not reporting company-by-company resource indemnity tax data.

Strip Coal Mines License Tax -- tax based on British Thermal Unit (BTU) rating of the coal extracted. This tax is applicable to strip coal mine operators. The first 5,000 pounds of coal is exempt, as is coal used by the miner for mining operations. The tax per ton depends on BTU rating per pound, as indicated in Table 11 below: The general fund of the county from which the coal is mined receives three cents per ton; the balance goes to the state general fund.

Table 11: Strip Coal Mine License Tax Rates

BTU Range Per Pound of Coal	Tax Per Ton of Coal
7,000 and below	$.12
7,001 - 8,000	.22
8,001 - 9,000	.34
9,001 and above	.40

Corporation License Tax -- tax on corporate net income. The Corporation License Tax is imposed on all corporations for the privilege of doing business in the State of Montana. The 1973 legislature set this tax at 6-3/4 percent of net income derived in Montana, with a minimum tax of $50. This is paid as an annual fee to the state treasurer, and several state funds are the beneficiaries: 64 percent goes to the General Fund, 25 percent to the School Equalization Fund and 11 percent to the long-range building program, or to the General Fund if the building program has sufficient current funding already. Corporate net income is derived basically as allowed in federal taxation, that being gross income less allowable corporate deductions to derive taxable corporate income. Because of certain confidentiality provisions, MEAC is not reporting company-by-company corporation license tax data.

Projected Coal Production:

Table 12 conveys MEAC's conservative estimate of Montana coal production for years 1974 through 1980. Except as footnotes indicate, it is based on existing coal sales contracts. Table 12 was compiled in late October 1974 and arbitrarily assumes, for purposes of calculation, that the future operations will meet the requirements of the Montana Strip Mine Siting, Mine Reclamation, Coal Conservation and Utility Siting Acts. Those future decisions will, of course, be determined by the regulatory agencies and boards, with full public involvement.

Table 12: Projected Montana Coal Production
From Coal Sales Contracts, By Year
(Data Gathered October 14 - 18, 1974 by MEAC Staff)

		1974	1975	1976	1977	1978	1979	1980
Peabody	1/	2,700,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
Western Energy	2/	2,837,000	5,230,000	10,430,000	13,500,000	14,900,000	17,700,000	19,100,000
Knife River	3/	320,000	320,000	320,000	320,000	320,000	320,000	320,000
Decker	4/	7,000,000	8,250,000	10,900,000	10,900,000	14,500,000	12,100,000	13,900,000
Westmoreland	5/	1,500,000	4,000,000	4,000,000	6,500,000	6,500,000	6,500,000	6,500,000
Totals		14,357,000	20,800,000	28,650,000	34,220,000	39,220,000	39,620,000	42,820,000

1/ The Peabody figures are estimates obtained from corporate headquarters, St. Louis, Missouri. Another major sales contract for their Big Sky Mine near Colstrip is presently being negotiated.

2/ Projections for Western Energy's Big Sky Mine at Colstrip include coal consumed at Colstrip Units I and II for 1975 and beyond. For 1978 - 1980, they include coal that would be furnished to Colstrip Units III and IV. If Units III and IV are not approved by the State of Montana, a projected 13,500,000 tons would be mined each year. Yearly totals would drop accordingly.

3/ Knife River Coal's mine at Savage, Montana, produces lignite exclusively for the 50 megawatt Lewis and Clark steam plant near Sidney. The mine's annual production for the last eight years averaged just over 321,000 tons.

4/ Projected production for the Decker Coal Mine north of the Town of Decker drops from 1978 to 1979, reflecting a short-term contract that expires in 1978. It is very likely that future coal sales contracts will bring 1979 and 1980 projections to 1978 levels.

5/ Westmoreland Resources has not yet negotiated a contract or contracts that would boost projections for its Sarpy Creek Mine to 6,500,000 tons in 1977. The company recently provided two unit train test shipments to domestic utilities, and MEAC believes that coal sales at the elevated level can be almost definitely anticipated.

Table 13 breaks down the 1975 and 1980 projections by coal use.

Table 13: 1975 and 1980 Coal Production by Coal Use (Millions of Tons)

Year	Electrical Generation in Montana		Coal for Export	
1975	0.32	Knife River for Sidney Plant	4.33	Western Energy Co.
	0.50	Western Energy for Corette Plant - Billings	8.25	Decker Coal Co.
	0.40	Western Energy for Colstrip I (coming on line)	4.00	Westmoreland
			3.00	Peabody
	1.22	million tons	19.58	million tons
1980	0.32	Knife River Coal Co.	10.00	Western Energy (min.)
	0.50	Corette Plant	13.90	Decker Coal
	3.00	Colstrip I and II (Western Energy)	3.00	Peabody
	5.60	Colstrip III and IV (Western Energy)	6.50	Westmoreland
	9.42	million tons	33.40	million tons

NGPRP Coal Development Profiles

The three NGPRP coal development profiles will be referred to throughout the remainder of this data sheet and are described as follows:

CDP I Coal production and energy conversion facilities adequate to meet Northern Great Plains regional demands and to supply existing sales contracts (base energy forecast).

CDP II The most probable forecast based on current demand trends.

CDP III An extensive development forecast showing possible effects of serious national shortfalls in imported oil and natural gas and delays in provision of nuclear generating capacity.

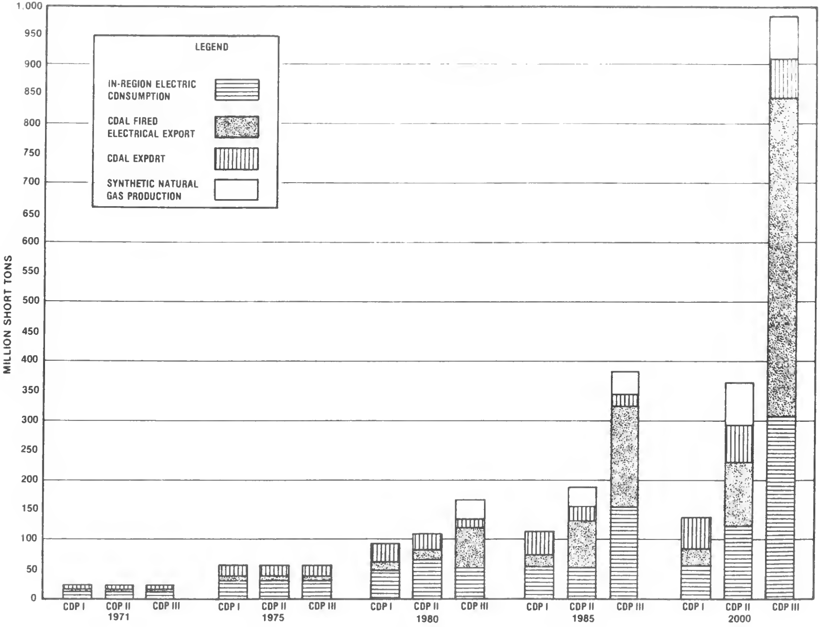
According to August communications with John VanDerwalker, Program Manager of the NGPRP, recent trends indicate that regional coal production in 1980 will be intermediate to the levels forecast for CDP II and CDP III.

Table 14 and Figure 3 display NGPRP coal development projections for Montana and the NGPRP region, respectively.

Table 14: NGPRP Projections of Montana Coal Production in Millions of Tons by CDP (Reference 5, Page III - 26)

	CDP I Base Energy	CDP II Most Probable	CDP III Extensive Development
1975	20	20	20
1980	34	41	64
1985	39	75	153
2000	58	133	393

II. Future Coal-Based Industrial Development.



Various forms of coal use for each CDP.

Figure 3

Table 15: Facilities Under Construction, Applied for or Publicly Proposed

Facility	Location	Capacity	Status
Colstrip I and II	Colstrip, Rosebud County	330 megawatts capacity each (330 megawatts equal 330,000 kilowatts).	Under construction by Bechtel Corporation for Montana Power (50%) and Puget Sound Power and Light (50%). Colstrip I due on line September 1975. Colstrip II due on line September 1976.
Transmission line	Colstrip - Broadview (about 110 miles)	230 kilovolts (230 kilovolts equal 230,000 volts).	On November 15, 1974, the Board of Natural Resources granted Montana Power and Puget Sound's request for shortening the time the Department of Natural Resources and Conservation had to consider the line. The Department requested a delay until Colstrip Units III and IV had been acted upon. Construction now proceeds with 230 KV lines to be strung on steel towers capable of supporting 500 KV transmission lines.
Colstrip III and IV	Colstrip, Rosebud County	700 megawatts capacity each.	Montana Power (30%), Puget Sound (25%), Portland Gas and Electric (20%), Washington Water Power (15%) and Pacific Power and Light (10%) have an application to construct pending before the Energy Planning Division, Montana Department of Natural Resources and Conservation. Final decision is made by the Board of Natural Resources. The Department's final environmental impact statement and recommendations will be before the Board on or before January 31, 1975.
Transmission line	Colstrip - Hot Springs (Sanders County) power company's preferred route is 426 miles long.	500 kilovolts to connect Colstrip III and IV with the Northwest power grid.	Application pending -- same status as Colstrip III and IV.

Table 15 Cont'd.

Facility	Location	Capacity	Status
Burlington Northern Synthetic Fuels Plant	Northwest of Circle, McCone County. Dreyer Brothers ranch - now wholly owned by Burlington Northern.	Daily production: 1,000 to 3,000 tons ammonia; 2,500 to 5,000 tons methanal-methyl fuel; 10,000 to 30,000 barrels synthetic diesel fuel; 12,000 to 32,000 acre feet of water; and 5 to 13 million tons of lignite would be consumed annually.	Dreyer Brothers Inc. (a BN subsidiary) has applied to the Dept. of Natural Resources and Conservation for rights to 67,000 acre feet of water annually from Fort Peck Reservoir for industrial and irrigation use. Construction for segments of the industrial complex could start within the following time frames: ammonia - 2 years; methyl fuel - 3 to 5 years; and synthetic diesel fuel - 5 years. No construction decisions have been made -- BN proceeding with feasibility studies. It is uncertain whether the facilities would be subject to the Montana Utility Siting Act.
Northern Natural Gas -- Cities Service Gas Company gasification complex (Reference 10, Table 3-8)	Southeast Montana or Northwest Wyoming.	Four "standard" synthetic natural gas (SNG) plants, 250 million cubic feet per day capacity each -- complex to use a total of 108,500 tons of coal per day.	Northern Natural and Cities Service plan to construct four 250 million feet per day coal gasification plants. Peabody Coal has agreed to supply 800 million tons of coal and the gas companies are negotiating for another like amount. Through 1975, 10 to 11 million dollars will be spent on initial development; construction could start in 1976-77 with operation in 1979 or 1980. Peabody's reserves lie within the NE portion of the Northern Cheyenne Reservation and their validity is in doubt.
Colorado Interstate Gas -- Westmoreland Coal Company (Reference 10, Table 3-8)	Southeast Montana.	One "standard" SNG plant using 25,000 tons of coal per day.	Colorado Interstate has an option on 300 million tons of coal and 10,000 acre feet per year of water to be supplied by Westmoreland for development of a gasification project. Status of feasibility studies unknown.

Table 16 was compiled by the Reclamation Division, Department of State Lands. It provides detailed information on each of the 90 exploration permits issued pursuant to the Montana Strip Mining and Reclamation Act. Figure 4 indexes by company the areas being most actively drilled.

Table 17, prepared by the Department of Natural Resources, lists major, presumably coal-related water rights applications pending with the Montana Department of Natural Resources. The Yellowstone Basin applications are now in limbo as per terms of Yellowstone Basin water moratorium legislation enacted in 1974. Table 18 lists filed industrial water rights and existing federal water use options.

Figure 5 locates the approximate points of diversion for water right filings, federal water use options and applications for water rights.

According to the Northern Great Plains Resource Program (reference 5, page IV-35), applications for federal water use options have been submitted for an additional 1,180,000 acre feet of water annually. The applications are for 630,000 acre feet from Big Horn Reservoir; 220,000 acre feet from the proposed Moorhead Reservoir on the Powder River; and 310,000 acre feet from Fort Peck Reservoir. At present, it does not seem likely that the option applications will be granted in full.

Accordingly, the applications for options were not treated in the following analysis of potential industrial depletion of the Yellowstone River.

Industrial Depletion -- Yellowstone River

Filed	587,440	acre feet per year
Federal Options (Yellowtail)	623,000	
Water Rights Applications	973,300	
	2,183,740	
Minus Dreyer Brothers Fort Peck	- 67,000	
Duplication (Tongue River) 1/	- 261,400	
Duplication (Powder River) 2/	- 283,100	
	1,572,240	

1/	Montana Water Storage Co.	170,000
	Water Reserve Co.	127,200
	Basin Electric	36,200
		333,400
	Minus Available	- 72,000
		261,400
2/	Intake Water Co.	318,700
	Utah International, Inc.	72,400
		391,100
	Minus Available	- 108,000
		283,100

Table 16: Status of Prospecting Permits
Chapter 325, SLM, 1973

Company	Application Number	Date	Permit Number	Date Issued	Bond	Area To Be Disturbed (Acres)[1]	Holes Drilled[2]	County	Mineral	Status[3]
Kerr-McGee	1	5/24/73	5	6/30/73 Reissued 10/1/73	40,000	30.0	333	Carter	Uranium	Expired 10/1/74
Peabody Coal	2	6/1/73	23	9/4/73 Reissued 10/29/73	164,500	154.5	1,228	Rosebud	Coal	Renewed 10/29/74
Peabody Coal	3	6/1/73	24	9/4/73 Reissued 10/29/73	63,300	53.3	0	Powder River	Coal	Renewed 10/29/74
Mobil Oil	4	6/8/73	3	6/21/73 Reissued 9/21/73	38,500	28.5	188	Carter	Uranium	Expired 9/21/73
Tenneco Coal	5	6/11/73	2	6/14/73 Inactive	20,000	7.9	44	Prairie	Coal	Expired 9/28/73
Tenneco Coal	6	6/11/73	1	6/14/73 Inactive	20,000	11.9	76	Dawson	Coal	Expired 9/28/73
Tenneco Coal	7	6/14/73	4	6/15/73 Inactive	27,700	27.7	75	Custer	Coal	Expired 9/28/73

---

[1] Area to be disturbed = number of holes x 1/10 acre per hole.

[2] Holes drilled -- compiled from monthly progress reports submitted through October 15, 1974.

[3] Status -- if blank, permit is active.

Table 16 Cont'd.

Company	Application Number	Date	Permit Number	Date Issued	Bond	Area To Be Disturbed (Acres) [1]	Holes Drilled [2]	County	Mineral	Status [3]
Mobil Oil	8	6/21/73	8	6/30/73 Reissued 10/25/73	20,000	1.5	20	Wibaux	Coal Uranium	To Be Renewed-Inactive
Mobil Oil	9	6/21/73	7	6/30/73 Reissued 10/25/73	20,000	1.0	11	Fallon	Coal Uranium	To Be Renewed-Inactive
Mobil Oil	10	6/21/73	6	6/30/73 Reissued 10/25/73	20,000	13.5	99	Dawson	Coal Uranium	To Be Renewed-Inactive
Felmont Oil	11	6/22/73	15	8/6/73 Reissued 9/21/73	77,500	63.5	429	Carter	Uranium	Renewed 9/21/74
Sun Oil	12	7/2/73	9	7/16/73 Reissued 9/21/73	17,100	7.1	54	Powder River	Coal	Expired 9/21/74
Mobil Oil	13	7/9/73	12	7/30/73 Reissued 9/27/73	20,000	3.4	26	Mussel-shell	Uranium	To Be Renewed-Inactive
Mobil Oil	14	7/9/73	11	7/26/73 Reissued 10/2/73	20,000	2.4	14	Yellow-stone	Uranium	Renewed 11/1/74
Utah International	15	7/12/73	14	7/31/73 Inactive	20,000	1.0	12	Custer	Coal	Expired 9/28/73
Teton Exploration	16	7/13/73	16	8/6/73 Inactive	20,000	3.0	25	Fallon	Uranium	Expired 9/28/73
American Nuclear	17	7/18/73	13	7/31/73 Inactive	13,300	4.5	26	Carter	Uranium	Expired 9/28/73

Table 16 Cont'd.

Company	Application Number	Date	Permit Number	Date Issued	Bond	Area To Be Disturbed (Acres)[1]	Holes Drilled[2]	County	Mineral	Status[3]
Decker Coal	18	7/18/73	10	7/23/73 Reissued 9/21/73	150,000	140.0	718	Big Horn	Coal	Renewed 9/21/74
Tenneco	19	7/18/73	20	8/10/73 Reissued 9/26/73	24,100	14.1	76	Richland	Coal	Expired 9/26/74
Tenneco	20	8/1/73	17	8/6/73 Inactive	20,000	10.8	87	Fallon	Coal	Expired 9/28/73
Tenneco	21	8/1/73	18	8/6/73 Inactive	20,000	2.4	16	Carter	Coal	Expired 9/28/73
Tenneco	22	8/1/73	22	8/23/73 Reissued 9/27/73	20,000	6.3	14	Rosebud	Coal	Expired 9/27/74
Mobil	23	8/2/73	21	8/13/73 Reissued 9/21/73	20,000	6.0	44	Garfield	Uranium	Expired 9/21/74
Western Energy	24	8/8/73	19	8/9/73 Reissued 9/27/73	100,000	90.0	854	Rosebud	Coal	Renewed 9/27/74
Mobil Oil	25	8/8/73	27	10/2/73	20,000	0.7	5	Golden Valley	Uranium	Renewed 11/1/74
Western Nuclear	26	8/20/73	33	10/9/73	20,000	0.5	5	Carbon	Uranium	Expired 10/9/74

Table 16 Cont'd.

Company	Application Number	Date	Permit Number	Date Issued	Bond	Area To Be Disturbed (Acres) [1]	Holes Drilled [2]	County	Mineral	Status [3]
Montana Nuclear	27	8/27/73	Never Issued - No Bond Submitted				0	Carter	Uranium	Not Issued
Wold, John S.	28	8/30/73	34	10/25/73	20,000	4.5	15	Wibaux	Coal	Expired 10/25/74
Mobil Oil	29	9/4/73	32	10/17/73	22,000	0.3	1	Petroleum	Uranium	Renewed 11/1/74
Mobil Oil	30	9/4/73	31	10/17/73	76,000	2.8	9	Judith Basin	Uranium	Renewed 11/1/74
Mobil Oil	31	9/4/73	30	10/17/73	56,000	4.3	19	Fergus	Uranium	Renewed 11/1/74
Tenneco	32	9/4/73	25	9/26/73	30,700	20.7	110	Wibaux	Coal	Renewed 9/26/74
Westmoreland Resources	33	9/28/73	26	9/28/73	16,900	6.9	64	Big Horn	Coal	Expired 9/28/74
Tenneco	34	9/18/73	39	10/31/73	17,400	7.4	55	McCone	Coal	Expired 10/31/74
Tenneco	35	9/18/73	40	10/31/73	12,400	2.4	26	Garfield	Coal	Expired 10/31/74
Tenneco	36	9/18/73	29	10/15/73	15,000	5.0	13	Roosevelt	Coal	Expired 10/15/74
Tenneco	37	9/18/73	28	10/15/73	14,500	4.5	35	Sheridan	Coal	Expired 10/15/74
Burlington Northern	38	10/10/73	46	12/12/73	20,000	1.6	14	Fallon	Coal	

Table 16 Cont'd.

Company	Application Number	Date	Permit Number	Date Issued	Bond	Area To Be Disturbed(Acres) 1/	Holes Drilled 2/	County	Mineral	Status
Continental Oil	39	10/17/73	38	10/30/73	10,400	.3	3	Powell	Uranium	Expired 10/30/74
Continental Oil	40	10/17/73	37	10/30/73	11,300	.8	8	Gallatin	Uranium	Expired 10/30/74
Consolidation Coal	41	10/24/73	44	11/26/73	14,300	4.3	12	Prairie	Coal	
Consolidation Coal	42	10/24/73	43	11/26/73	43,500	33.0	103	Custer	Coal	
Continental Oil	43	10/17/73	35	10/30/73	10,800	1.0	8	Broad-water	Uranium	Expired 10/30/74
Continental Oil	44	10/17/73	36	10/30/73	10,600	1.0	2	Deer Lodge	Uranium	Expired 10/30/74
Continental Oil	45	10/31/73	41	11/5/73	11,500	1.1	11	Sweet Grass	Uranium	
Mobil Oil	46	11/19/74	50	1/7/74	17,000	4.0	14	Richland	Coal	
Wold, John S.	47	11/19/73	42	11/20/73	20,000	0.7	3	Roosevelt	Coal	
Mobil Oil	48	11/26/73	45	12/12/73	13,000	2.8	9	McCone	Coal	
Phillips	49	12/11/73	53	1/16/74	10,800	0.8	4	Dawson	Coal	
Phillips	50	12/11/73	51	1/16/74	14,700	4.7	14	Custer	Coal	

Table 16 Cont'd.

Company	Application Number	Date	Permit Number	Date Issued	Bond	Area To Be Disturbed (Acres) 1/	Holes Drilled 2/	County	Mineral	Status
Phillips	51	12/11/73	52	1/16/74	12,000	2.0	13	Prairie	Coal	
Tenneco	52	12/12/73	47	12/17/73	18,800	4.5	40	Fallon	Coal	
Tenneco	53	12/13/73	48	12/18/73	18,100	3.1	25	Dawson	Coal	
American Nuclear	54	12/17/73	49	12/18/73	see 13	0.7	7	Carter	Uranium	
Burlington Northern	55	1/3/74	56	2/4/74	15,000	3.5	37	McCone	Coal	
Western Energy	56	1/3/74	60	2/25/74	22,000	12.0	43	Custer	Coal	
Western Energy	57	1/3/74	54	1/18/74	45,000	35.0	167	Fallon	Coal	
Western Energy	58	1/3/74	55	1/21/74	14,000	4.0	13	Carter	Coal	
McCartney, Clay H.	59	1/17/74	57	2/11/74	25,000	15.0	101	Blaine	Coal	
Mobil Oil	60	1/24/74			20,000	10.0	0	Rosebud	Coal	Not Issued
Consolidation Coal	61	2/15/74	58	2/19/74	33,000	21.4	0	Treasure	Coal	
Consolidation Coal	62	2/15/74	59	2/19/74	32,700	21.4	59	Big Horn	Coal	
Consolidation Coal	63	3/19/74	64	6/24/74	48,100	38.1	171	Rosebud	Coal	
Getty Oil	64	4/26/74	82	9/19/74	15,000	4.6	0	Dawson	Coal	
Getty Oil	65	4/26/74	79	9/13/74	12,000	2.0	0	Richland	Coal	
McCartney, Clay H.	66	4/30/74	62	5/28/74	15,000	3.0	[illegible]	Hill	Coal	

Table 16 Cont'd.

Company	Application Number	Date	Permit Number	Date Issued	Bond	1/ Area To Be Disturbed (Acres)	2/ Holes Drilled	County	Mineral	Status
Amax Coal	67	5/2/74	74088	10/7/74	11,900	1.9	0	Powder River	Coal	
Concho Petroleum	68	5/7/74	61	5/10/74	10,300	0.3	3	Big Horn	Coal	
Utah International	69	5/15/74	71	7/22/74	13,000	2.3	18	Madison	Uranium	
Continental Oil	70	5/28/74	65	7/2/74	0	0	0	Jefferson	Uranium	Inactive
Continental Oil	71	5/28/74	66	7/2/74	0	0	0	Madison	Uranium	Inactive
Chevron Oil	72	5/30/74	63	6/13/74	15,000	3.0	11	Garfield	Coal	
Gulf Mineral	73	6/11/74	67	7/2/74	20,900	10.9	73	Custer	Coal	
Gulf Mineral	74	6/13/74	68	7/2/74	18,800	8.8	65	Powder River	Coal	
Exxon	75	6/13/74	69	7/10/74	10,300	0.3	0	Silver Bow	Uranium	
Exxon	76	7/1/74	72	7/24/74	31,300	21.3	45	Carter	Uranium	
Knife River Coal	77	7/2/74	70	7/15/74	10,600	0.6	0	Richland	Coal	
Wold, John	78	7/5/74	75	8/6/74	20,000	1.2	13	Dawson	Coal	
Sun Oil	79	7/5/74	73	7/25/74	12,000	2.0	0	Richland	Coal	
Sun Oil	80	7/5/74	74	7/25/74	18,900	9.0	70	Dawson	Coal	
Consol	81	7/17/74	84	10/1/74	15,000	5.0	0	Powder River	Coal	
Mobil	82	7/26/74	77	9/4/74	11,200	1.2	0	Powder River	Coal Uranium	

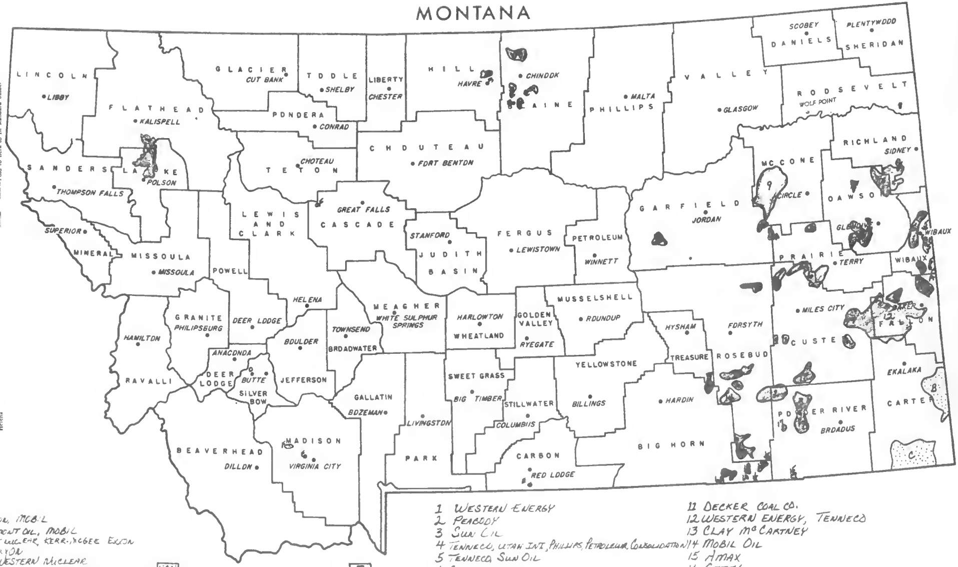
Table 16 Cont'd.

Company	Application Number	Date	Permit Number	Date Issued	Bond	Area To Be Disturbed (Acres) 1/	Holes Drilled 2/	County	Mineral	Status
N.R.G.	83	8/1/74	80	9/11/74	12,300	2.3	0	Big Horn	Coal Uranium	
Utah International	84	8/5/74	81	9/11/74	15,000	3.3	2	Cascade	Uranium	
Crisafulli	85	8/2/74	76	8/27/74	11,900	1.9	19	Dawson	Coal	
N.R.G.	86	8/16/74	78	9/6/74	12,500	2.5	0	Powder River	Coal Uranium	
Utah International	87	9/3/74	85	10/4/74	18,000	8.0	0	Garfield	Coal	
Utah International	88	9/3/74	86	10/4/74	15,000	4.3	0	Prairie	Coal	
Utah International	89	9/3/74	87	10/4/74	13,000	2.9	0	McCone	Coal	
Agri-Empire, Inc.	90	10/15/74			12,100	2.1		Prairie	Coal	Not Issued

Note: Total Bond on File $2,179,500
Total Holes Permitted 10,758
Total Holes Drilled 6,026
Data current as of October 15, 1974.

RECLAMATION DIVISION
DEPARTMENT OF STATE LANDS

Figure 4



A TETON, MOBIL
B FELMONT OIL, MOBIL
C MONT NUCLEAR, KERR-MCGEE EXXON
D EXXON
E WESTERN NUCLEAR
F UTAH INTERNATIONAL

A URANIUM

5 COAL

PROSPECTING ACTIVITY
CHAPTER 325 SLM 1947

NOTE: ONLY [illegible] OF AREAS WHERE DRILLING OCCURS ON 1/2 MILE CENTERS OR CLOSER ARE REPRESENTED

1 WESTERN ENERGY
2 PEABODY
3 SUN OIL
4 TENNECO, UTAH INT., PHILLIPS, PETROLEUM, CONSOLIDATION
5 TENNECO, SUN OIL
6 CONSOLIDATION
7 CONSOLIDATION, TENNECO
8 JOHN WOLD
9 TENNECO, BURLINGTON NORTHERN, MOBIL
10 TENNECO, MOBIL, GETTY
11 DECKER COAL CO.
12 WESTERN ENERGY, TENNECO
13 CLAY MC CARTNEY
14 MOBIL OIL
15 AMAX
16 GETTY
17 NRG CO.
18 GULF
19 UTAH INTERNATIONAL
20 CHEVRON

Given the duplications of competing water right applications, federal options and applications for options, it is clear that the industrial interests in Yellowstone Basin water cannot be met without significant new storage projects.

Table 17: Major Water Right Applications (State)

Little Missouri Basin		
Intake Water Company	36,000 AF/Yr.	Beaver Creek
Missouri River Basin		
Burlington-Northern (Dreyer Brothers)	67,000 AF/Yr.	Fort Peck Reservoir
Yellowstone River Basin		
Montana Water Storage Co. 1/	170,000 AF/Yr.	Tongue River
Water Reserve Co. 1/	127,200 AF/Yr.	Tongue River
Getty Oil	92,000 AF/Yr.	Yellowstone River
Gulf Mineral Resources Co.	90,000 AF/Yr.	Yellowstone Basin
Intake Water Co. 2/	318,700 AF/Yr.	Powder River
Utah International 2/	72,400 AF/Yr.	Powder River
Total	973,300 AF/Yr.	

1/ These rights are duplicative in that Basin Electric has an existing filing on 36,200 AF/Yr. (see Table 18) and a study by the Department of Natural Resources and Conservation shows only 72,000 AF available for development.

2/ These rights are duplicative. A U.S. Bureau of Reclamation study of the proposed Moorhead Dam indicates that there are only 108,000 AF available for development.

Table 18: Filed Industrial Water Rights[1/] and Federal Options

State (Filed Rights)

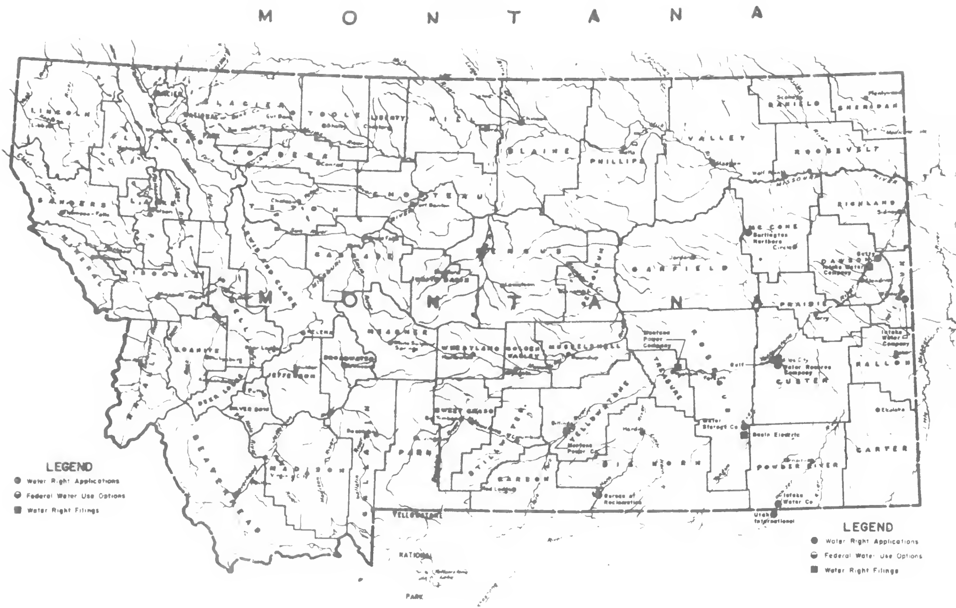
Montana Power Co.	144,795 AF/Yr.	Yellowstone River at Billings 1950
Montana Power Co.	144,795 AF/Yr.	Yellowstone River at Billings 1966
Montana Power Co.	181,000 AF/Yr.	Yellowstone River
Intake Water Co.	80,650 AF/Yr.	Yellowstone River
Basin Electric	36,200 AF/Yr.	Tongue River
Total	587,440 AF/Yr.	

Federal Options (Bureau of Reclamation) 2/

Gulf Oil Company	50,000 AF/Yr.	Big Horn Reservoir
Exxon Oil Company	50,000 AF/Yr.	Big Horn Reservoir
Peabody Coal Company	80,000 AF/Yr.	Big Horn Reservoir
Shell Oil	48,000 AF/Yr.	Big Horn Reservoir
Westmoreland	30,000 AF/Yr.	Big Horn Reservoir
Total	258,000 AF/Yr.	

1/ Actual water rights will not be determined until pending court cases are decided and the Yellowstone Basin is adjudicated.

2/ Options shown are those proposed to be used in Montana. Federal options total 623,000 AF/Yr. The additional water is proposed to be withdrawn upstream in Wyoming. Potential Montana impacts of coal-related water consumption should be evaluated using the water option total.


MONTANA
LINCOLN
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
RICHLAND
MC CONE
Burlington Northern
Circle
DAWSON
Tenneco Water Company
Glendive
FLATHEAD
PONDERA
TETON
CHOUTEAU
SANDERS
LAKE
MINERAL
MISSOULA
CASCADE
JUDITH BASIN
FERGUS
PETROLEUM
GARFIELD
PRAIRIE
WIBAUX
Terry
Intake Water Company
FALLON
Baker
ROSEBUD
Western Energy Company
Forsyth
Colstrip
Gulf
Miles City
Water Resources Company
CUSTER
TREASURE
Water Storage Co
Basin Electric
POWDER RIVER
CARTER
Ekalaka
Intake Water Co
Utah International
BIG HORN
Hardin
Bureau of Reclamation
YELLOWSTONE
Billings
Montana Power Co
CARBON
Red Lodge
STILLWATER
SWEET GRASS
WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
MEAGHER
BROADWATER
JEFFERSON
LEWIS AND CLARK
POWELL
GRANITE
RAVALLI
DEER LODGE
SILVER BOW
BEAVERHEAD
MADISON
GALLATIN
PARK
MISSOURI RIVER
YELLOWSTONE NATIONAL PARK
LEGEND
● Water Right Applications
◒ Federal Water Use Options
■ Water Right Filings
LEGEND
● Water Right Applications
◒ Federal Water Use Options
■ Water Right Filings

III. Impact Data.

A. Electrical Generation Facilities.

Table 19: Generalized Specifications of Hypothetical 1000 Megawatt Power Plant in Decker-Birney Area (Reference 3, Page 9)

Plant Requirements	
Employment	165 employees
Water	18,000 acre feet per year
Acreage	500 acres
Coal Requirements	
Tons per year	3,800,000 tons
Reserve requirements	166,000,000 tons
Employment	100 employees
Acreage (current)	519 acres
Acreage (total)	2,728 acres
Plant Emissions (limited listing)	
Sulfur	10,260 lbs./hr.
Nitrous oxides	7,180 lbs./hr.
Water vapor	6,333,000 lbs./hr.
Particulate	400 lbs./hr.
Population Impact	
Project employment	265 employees
Secondary jobs	450 employees
Total new employment	715 employees
Total population increase	2,100 people

(Note: The population impact data are for a power plant in operation. The numbers do not reflect the large work force necessary to construct the plant.)

Table 20: Impact Data Projections For Colstrip Project (Plants I, II, III and IV) Reference 11

Plant Requirements	
Employment	160 employees
Water	39,000 acre feet per year
Acreage	700 acres plus plant complex, surge pond and ash pond
Coal Requirements	
Tons per year	Approximately 9 million tons per year (varies with load factor)
Total mine employment	500 employees
Acreage (current)	
Acreage (total)	11,000 acres
Population Impact (not including construction force)	
Total service personnel	160 employees
Total project employment	820 employees
Secondary jobs	2,214 employees
Total new employment	3,034 employees
Total population increase	8,499 people */

(Note: Montana's Energy Planning Division will release definitive data on the Colstrip project within a few weeks. The data presented herein should be regarded as sketchy and preliminary.)

---

*/ 2.8 multiplier - statewide ratio of population to jobs in 1970.

B. Coal Gasification Facilities.

Table 21: Generalized Specifications of Hypothetical 250 Million Cubic Feet Per Day Coal Gasification Plant in Decker-Birney Area (Reference 3, Pages 8-9)

Plant Requirements	
Employment	600 employees
Water	17,000 acre feet per year
Acreage	1,030 acres
Coal Requirements	
Tons per year	8,000,000 tons
Reserve requirements	300,000,000 tons
Employment	170 employees
Plant Emissions (limited listing)	
Sulfur	1,704 lbs./hr.
Nitrous oxides	713 lbs./hr.
Water vapor	1,681,111 lbs./hr.
Particulate	50 lbs./hr.
Population Impact	
Project employment	770 employees
Secondary jobs	1,310 employees
Total new employment	2,080 employees
Total population increase	6,131 people

(Note: The population data do not reflect the construction force.)

Table 22: Selected Impact Data for 288 Million Cubic Feet Per Day El Paso Gasification Plant, Farmington, New Mexico, First High BTU Gasification Plant To Be Built Using Western Coal, Proposed To Be On Line In Mid-1978 (Reference 12)

Plant Requirements

Employment	883 employees
Water	8,250 acre feet per year
Land	1,915 acres

Mine Requirements

Coal	9,383,000 tons per year (8,664 BTU per pound)
Employment	351 employees
Water	2,110 acre feet per year (mine operation, irrigation, dust control, etc.)

Plant Emissions (reference 12, pages 4 - 10)

Hydrogen sulfide (H_2S), carbon disulfide (CS_2), carbonyl sulfide (COS) -- combined emissions of these three compounds from any stack shall not exceed 100 parts per million (ppm) by volume. H_2S by itself will not exceed 10 ppm by volume.

Hydrogen cyanide (HCN) -- emissions from any stack not to exceed 10 ppm by volume.

Hydrochloric acid (HCl) -- emissions from any stack not to exceed 5 ppm by volume.

Ammonia -- emissions from any stack not to exceed 25 ppm by volume.

Project Employment	1,234 employees
Secondary Jobs	2,468 employees
Total New Employment	3,702 employees
Total Population Increase	9,625 people

(Note: The population data do not reflect the construction force.)

C. Coal Strip Mines.

Table 23: Generalized Specifications of Hypothetical 10 Million Ton Per Year Strip Mine in Decker-Birney Area (Reference 3, Page 9)

Coal Requirements	
Tons Per Year	10,000,000 tons
Reserve Requirements	375,000,000 tons
Employment	200 employees
Population Impact	
Project Employment	200 employees
Secondary Jobs	340 employees
Total New Employment	540 employees
Total Population Increase	1,590 people

Table 24 (reference 5, page IV-15) projects cumulative coal development land disturbances in the Northern Great Plains. Table 25 is a Department of State Lands' calculation of the coal acres required for the extraction of the tonnage reported at four Montana strip mines for the years 1968-1973. The figures are for acres of coal required and do not represent total mine disturbances.

The data calculations do not include unmined land upon which initial spoils are placed. Neither do they include associated disturbances from railroad loops, access roads, nor maintenance and processing facilities.

For similar calculations of future coal acreages required at given mine sites, the reader may use the following procedure.

1. Assume 1,730 tons of coal per acre-foot of coal deposit.
2. Assume 95% recovery (1,644 tons recovered per acre foot of coal).
3. Assume the following average thicknesses for each mine's coal deposits — Decker and Westmoreland, 52 feet; Peabody (total of two seams), 33 feet; Western Energy, 24 feet; Knife River, 16 feet.

4. Multiply the thickness of the coal deposit by 1,644 to obtain coal recovered per acre.

5. Divide that product into the given company's projected tonnage to obtain the acres mined in the subject year.

6. Example: Western Energy's 1980 production is projected at 19,100,000 tons (Table 12). Acres of coal required is calculated as follows:

$$24 \times 1{,}644 = 39{,}456 \text{ tons recovered per acre}$$

$$\frac{19{,}100{,}000 \text{ tons}}{39{,}456 \text{ tons per acre}} = 484 \text{ acres required}$$

Table 24: Lands Impacted (In Acreages)[1]
Total Fort Union Portion of Northern Great Plains

			CDP I (Base Energy)		
	1980	1985	2000	2020[5]	2035[5]
Mined Land[2] [3]	5,387	16,142	50,478	130,438	190,408
Plant Facilities [4]	2,694	2,694	4,935	4,935	4,935
Ancillary Facilities	-	-	44,879	44,879	44,879
Totals	8,081	18,836	100,292	180,252	240,222

---

[1] Acreages occupied by urban growth not determined, acreages occupied by ancillary facilities analyzed only for CDP III, year 2000 and 2035 and assumes all facilities would remain operational through 2035.

[2] Acreages mined up to dates indicated.

[3] Acreages occupied with plants, yards and other facilities directly associated with plants and mines.

[4] Acreages occupied by railroads, highways, haul roads, transmission lines, aqueducts and reservoirs were calculated only at year 2000.

[5] Acreages for 2020 - 2035 are based on mines operating at year 2000 level or development.

Table 24 Cont'd.

	CDP II (Most Probable)				
	1980	1985	2000	2020[5]	2035[5]
Mined Land[2] [3]	5,500	19,409	100,795	364,255	561,850
Plant Facilities [4]	2,993	11,706	26,227	26,227	26,227
Ancillary Facilities	-	-	82,518	82,518	82,518
Totals	8,493	31,115	209,540	473,000	670,595

	CDP III (Extensive Development)				
Mined Land[2] [3]	10,938	44,107	227,705	842,685	1,303,920
Plant Facilities [4]	9,200	26,040	59,330	59,330	59,330
Ancillary Facilities	-	-	109,890	109,890	109,890
Totals	20,138	70,147	396,925	1,011,905	1,473,140

1/ - 5/ See previous page.

Table 25: Calculations of Acres Required to Produce Tonnages Reported for Montana Strip Mines

Company	Year	Tonnage	Acreage
Peabody	1968	41,000	1
	1969	163,769	3
	1970	1,437,955	27
	1971	1,495,043	28
	1972	1,601,180	30
	1973	1,480,597	27
			116

Table 25 Cont'd.

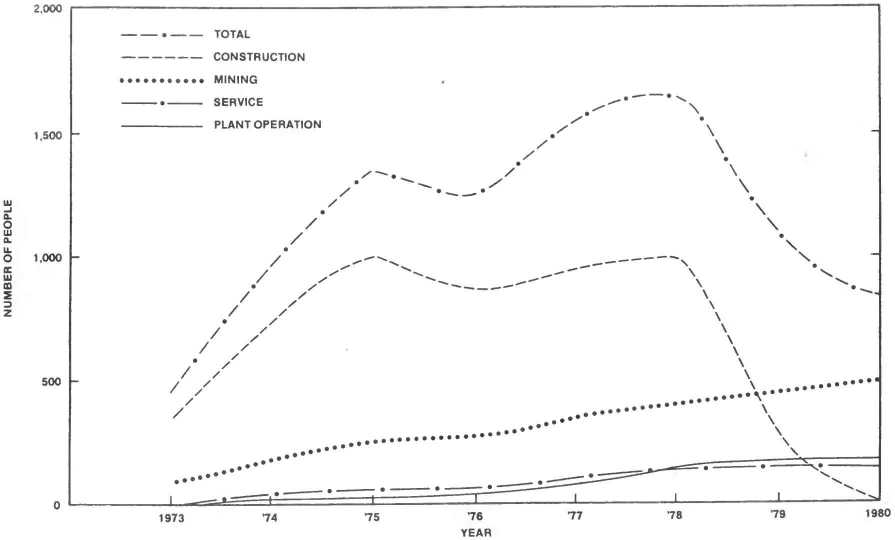
Company	Year	Tonnage	Acreage
Western Energy	1968	150,000	4
	1969	520,000	13
	1970	1,660,000	41
	1971	5,160,000	126
	1972	5,500,000	134
	1973	4,700,000	114
			432
Knife River	1968-73	320,000/yr.	16/yr.
Decker	1970	74,856	1
	1971	none	none
	1972	none	none
	1973	3,837,457	45
			46

(Note: Estimated total acres disturbed by mining in 1968 through 1973 is 683 acres. 100-150 acres associated facilities per mine.)

D. Miscellaneous Employment, Groundwater and Air Quality Impact Data.

Figure 6 on the following page (reference 11, page 2-137) portrays a 1973 Montana Power Company projection of total employment elvels on the Colstrip Project. Figure 6 assumes construction of Colstrip Units III and IV. More detailed trade-by-trade employment projections are set forth in Figures 8-3 through 8-12 of Volume 3-A of the Montana Energy Planning Division's Draft Environmental Impact Statement on Colstrip Units 3 and 4 (reference 16).

Figure 6



PROJECTED ANNUAL AVERAGE EMPLOYMENT

ESTIMATED TOTAL ANNUAL AVERAGE EMPLOYMENT
ON THE COLSTRIP CONSTRUCTION PROJECT, 1972-1980

The first three columns of Table 26 (reference 11, page 238) lists October 1973 Colstrip Project construction employment on a trade-by-trade basis. The fourth column, recently provided by Montana Power's Planning Office (Butte), provides a similar breakdown for October 22, 1974, construction employment. Montana Power further noted that an additional 372 employees were employed October 22 in work other than construction of Colstrip Units I and II: 182 miners, 164 employed in construction of company housing and sewage facilities and 26 operating crew trainees for Units I and II.

Table 26: Total Construction Employment By Trade On The Colstrip Project (Oct. 1973, 1974)

Craft	Bechtel Total Working	Total of Others At Site	Total At Site	Total On Oct. 22, '74
Laborers	92	12	104	117
Carpenters	63	9	72	90
Millwrights	--	6	6	18
Ironworkers, structure	37	28	65	76
Ironworkers, reinforcement	--	--	--	3
Foremen	--	--	--	24
Boilermakers, general	8	34	42	100
Boilermakers, welders	--	--	--	13
Pipefitters, general	54	6	60	161
Pipefitters, welders	15	--	15	76
Pipefitters, trainees	18	--	18	16
Electricians	37	--	37	116
Operating Engineers	7	11	18	34
Air Compressor	--	--	--	4
Roller	--	--	--	2
Truck Cranes	2	--	2	4
Crawler	1	1	2	5
Hoists	2	--	2	5
Motor Patrol	--	--	--	1
Oilers	3	6	9	9
Tractor, other	1	--	1	4
Handi Crane	3	1	4	11
Heavy Duty Repair	2	2	4	4
Backhoe	3	--	3	6
Scraper	--	2	2	9
Camp Help	--	--	--	14
Truck Drivers	8	6	14	11
Warehousemen	--	--	--	4
Painters	--	1	1	22
Cement Finishers	8	--	8	5
Sheetmetal	--	--	--	6

Table 26 Cont'd.

Craft	Bechtel Total Working	Total of Others At Site	Total At Site	Total On Oct. 22, '74
Brickmason	2	--	2	0
Insulators	--	--	--	1
Lab Technicians	--	1	1	4
Security	--	4	4	5
Subtotal Manual	366	130	496	980
Superintendents	7	14	21	35
Engineers	19	1	20	49
Survey	6	--	6	13
Office	20	4	24	48
Warehouse & Safety, First Aid	7	1	8	12
Subtotal Non-Manual	59	20	79	157
Total	425	150	575	1,137

Figure 7 (reference 13, page 6) projects aggregated direct employment, derivative employment and increased populations for the Western Energy (Colstrip), Peabody (Colstrip) and Westmoreland (Sarpy Creek) operations.

The Employment Service data appear compatable with Bureau of Reclamation data presented in Figures 8 and 9 (reference 13, page 45-46) following.

Figure 10 (reference 5, page IV-68) and Figure 11 (reference 5, page IV-74) are to provide an introduction to the air quality issues associated with mine site electrical generation in Montana. Figure 10 compares sulfur oxide ambient air standards for various time frames with existing air quality in the Northern Great Plains and in Cleveland, Los Angeles and Denver. Note the comparisons between Montana's annual and 24-hour standards with air quality in urban areas. Figure 11 provides projections of the maximum SO_2 concentrations predicted by the Environmental Protection Agency for eight regional power complexes. Non-degredation issues, rather than meeting of existing standards, appear to be critical to coal development in the Northern Great Plains.

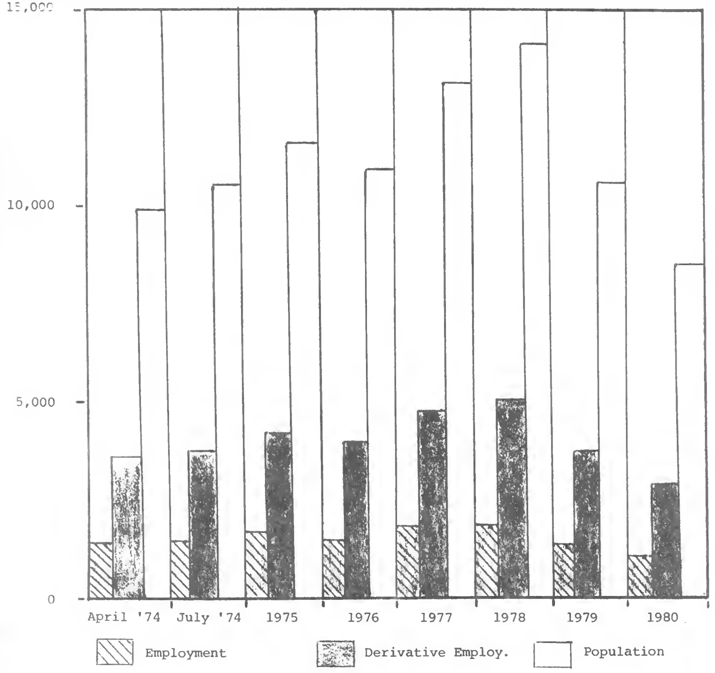
These data as applied to Colstrip III and IV are not to be taken as authoritative. They do not result from a detailed site-specific analysis. Such a detailed analysis will soon be forthcoming when the Department of Natural Resources issues a final environmental impact statement on the application to construct Colstrip Units III and IV and associated transmission lines (January 1975).

Figure 12 and Table 27 (reference 15, page 2) provide insight into the West's first detailed evaluation of the impacts of strip mining on groundwater hydrology. Van Voast observed groundwater levels before Decker area aquifers were disturbed by strip mining. Figure 12 provides observation well locations. Table 27 documents the water table drawdown that occurred after completion of the first cut. Van Voast summarized the "state of the art" about impacts of strip mining on water quality as follows:

> "Spoil leachates sampled near Colstrip (Van Voast, 1973, and Montana Bureau of Mines and Geology unpublished data) contained dissolved solids concentrations much greater than waters sampled from nearby shallow aquifers; calcium and magnesium were found in much greater concentrations than sodium. The spoil waters also contain small concentrations of trace metals including copper, lead, zinc, and nickel not found in other local waters. Near Decker, spoil waters are not yet available for analysis; the relatively high concentrations of sodium in waters in local aquifers corresponds with the high sodium concentrations found by Hodder and Sindelar for simulated spoils. If simple projections are valid, it can be predicted that spoil leachates at Decker will be even more strongly mineralized than those near Colstrip and that the principal cations will be calcium, magnesium and sodium."

Figure 7

Projections of Aggregated Direct Employment, Derivative Employment and Increase Populations for the Western Energy, Peabody and Westmoreland Operations



Assumptions for Graphs 3-1, 3-2, 3-3 and 4-1.

1. A derivative employment multiplier of 2.7 (i.e., 1.7 indirect or related jobs are derived from every basic job).
2. A population multiplier of 2.9 (i.e., every household contains 2.9 people with one worker, with the exception of construction workers who are 30% single).
3. Planned projections are not deviated from to any great extent.
4. Coal taxes are not increased to extreme heights and environmental regulations do not slow down or halt production.

Estimated Total Annual Average Construction Employment During Construction of Facilities For Mining, Electrical Plants, and Gasification Plants (Rosebud County, Montana, 1975-2000)

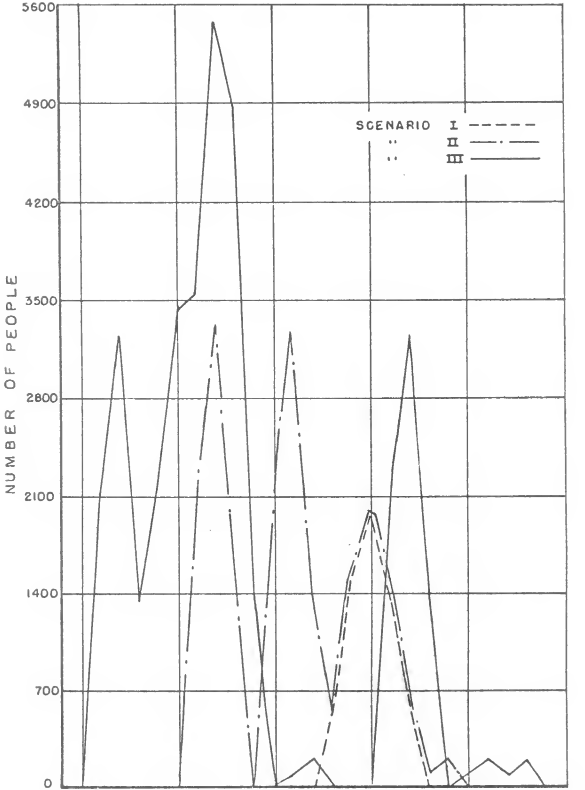


Figure 9

Estimated Total Annual Average Construction Employment During Construction of Facilities for Mining, Electrical Plants and Gasification Plants (Big Horn County, Montana, 1975-2000)

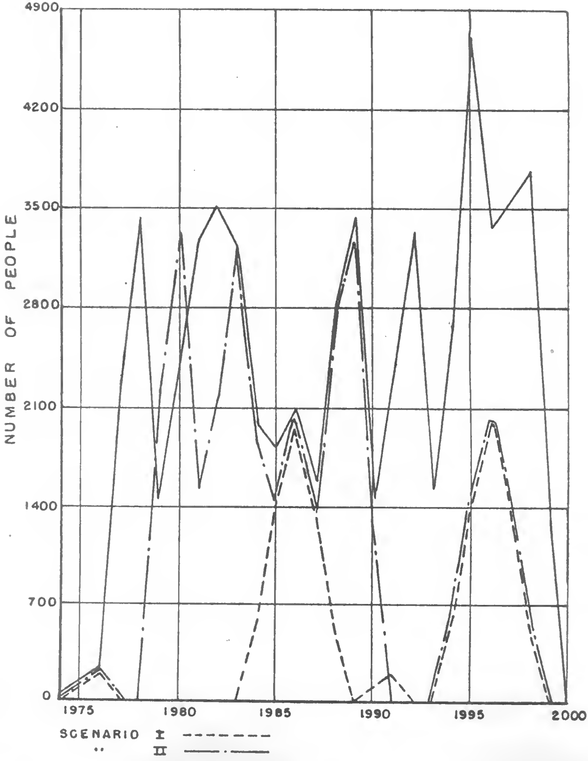


Figure 10

Sulfur Oxides -- Ambient Air Quality Data and Standards

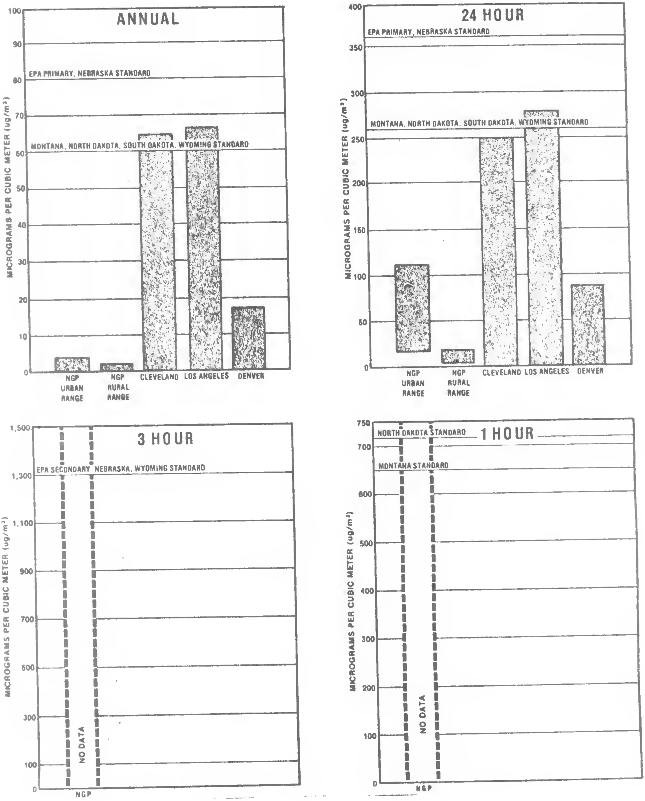
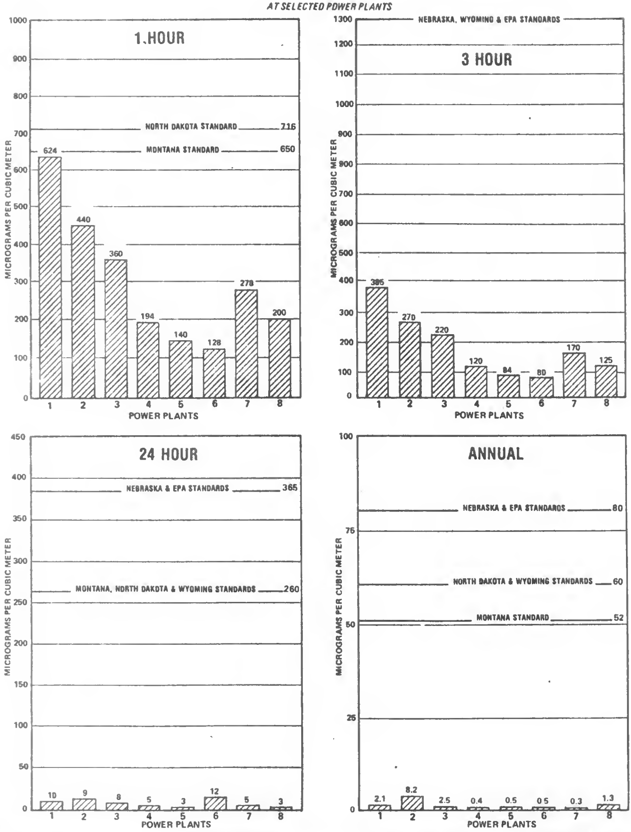


Figure 11

Maximum Ambient SO_2 Concentrations



1. COLSTRIP – 2060 MW
2. NAUGHTON – 1570 MW
3. BRIDGER – 1500 MW
4. UNDERWOOD – 972 MW
5. LELAND OLDS – 656 MW
6. GENTLEMAN – 650 MW
7. YOUNG – 635 MW
8. WYODAK – 330 MW

Index Map of Decker Monitoring Wells

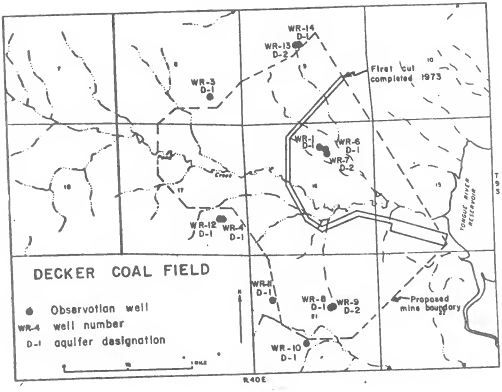


Table 27: Water Level Data For Observation Wells Near Decker Mine

Well number	Aquifer designation	First measurement depth to water (feet)*	date	Sept. 15, 1973 depth to water (feet)*	Water level decline (feet)
WR-1	D-1 coal	56.12	Aug. 10, 1970	81.62	25.50
WR-3	D-1 coal	159.23	Nov. 24, 1970	169.49	10.26
WR-4	D-1 coal	134.51	Mar. 30, 1971	147.53	13.02
WR-6	D-1 coal	55.97	Jun. 12, 1971	81.49	25.52
WR-7	D-2 coal	39.24	Jun. 21, 1972	48.48	9.24
WR-8	D-1 coal	90.41	Sep. 30, 1972	103.51	13.09
WR-9	D-2 coal	67.64	Sep. 30, 1972	73.22	5.58
WR-10	D-1 coal	92.46	Sep. 26, 1972	103.78	11.32
WR-11	D-1 coal	128.25	Sep. 26, 1972	139.01	10.76
WR-12	D-1 coal	138.99	Sep. 26, 1972	149.50	10.51
WR-13	D-2 coal	152.20	Sep. 26, 1972	154.49	2.29
WR-14	D-1 coal	157.60	Sep. 26, 1972	163.47	5.87

*Depths measured from land surface

REFERENCES

1. Northern Great Plains Resource Program (NGPRP), "Mineral Resources Work Group Draft Report," April 1, 1974.

2. Matson, Robert E., Montana Bureau of Mines' Unpublished Open File Report, 1974.

3. Bureau of Land Management and U.S. Forest Service, "Summary Decker-Birney Resource Study," April, 1974.

4. Matson, Robert E., and Blumer, John W., "Quality and Reserves of Strippable Coal, Selected Deposits, Southeastern Montana," Montana Bureau of Mines and Geology, Bulletin 91, December 1973.

5. NGPRP Draft Interim Report, September 1974.

6. Rosebud - Treasure County Committees for Rural Development, "Know This About Coal," May 1973.

7. Net proceeds tax data obtained from Montana Department of Revenue.

8. Significance of reclamation deduction data taken from testimony of Lt. Governor Bill Christiansen before Montana Legislative Subcommittee on Fossil Fuel Taxation, July 19, 1974.

9. Data compiled by Alan Taylor, Montana Department of Revenue, July-August 1974.

10. Interagency Synthetic Fuels Task Force (Under Direction of U.S. Department of the Interior), "Report to Project Independence Blueprint - Federal Energy Agency, Supplement I," July 8, 1974.

11. Applicants Environmental Analysis -- Colstrip Generation and Transmission Project, the Montana Power, Puget Sound, Power and Light, Portland General Electric, Washington Water Power, and Pacific Power and Light Companies, November 1973.

12. El Paso Coal Gasification Project, New Mexico, Draft Environmental Impact Statement, U.S. Department of the Interior, Bureau of Reclamation, July 16, 1974.

13. Nybo, Clarence and Kilburn, Pat,"Montana Mining and Manpower", Montana State Employment Service, Billings, April 1974.

14. Interim Summary of Recommendations -- projecting social and municipal service needs and cost and revenue calculations in six (NGP) counties where major coal development is anticipated, Bureau of Reclamation, Billings and Center for Interdisciplinary Studies, Montana State University, Bozeman, April 1974.

15. Van Voast, Wayne A.,"Hydrologic Effects of Strip Coal Mining in Southeastern Montana -- Emphasis: One Year of Mining Near Decker", Montana Bureau of Mines and Geology, Bulletin 93, June 1974.

REFERENCES CONT'D.

16. Energy Planning Division, Montana State Department of Natural Resources and Conservation,"Draft Environmental Impact Statement on Colstrip Electrical Generating Units 3 and 4, 500 KV Transmission Lines and Associated Facilities," November 1974.